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AGRICULTURAL ENGINEERING

JANUARY 1943

Agricultural Engineers: Engineer Corps of the Food Army — *H. B. Walker*

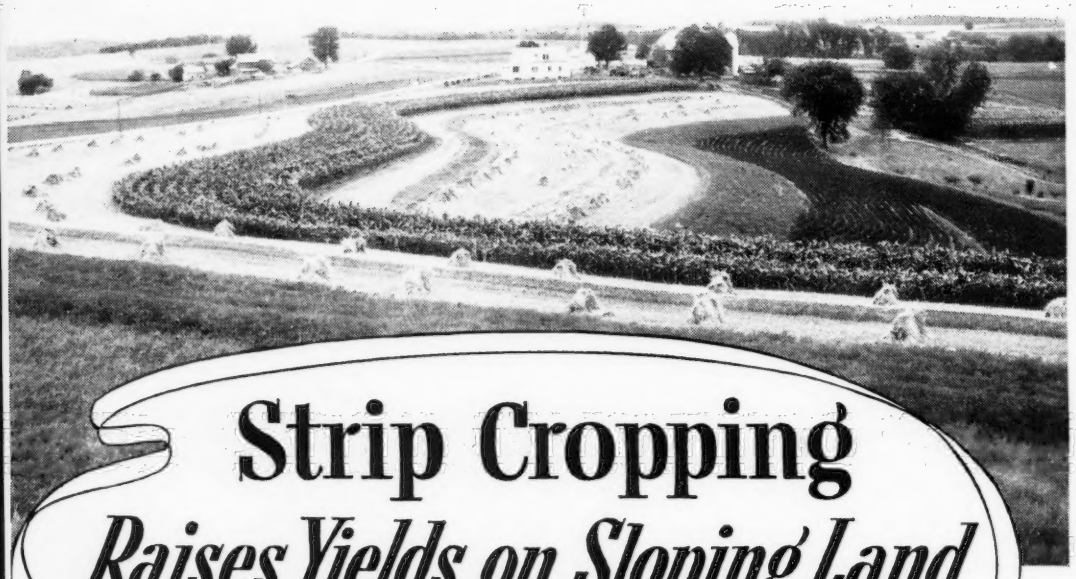
Prefabrication of Farm Structures a Promising Development — *J. D. Long*

The 1943 Nation-Wide Farm Equipment Conservation Program — *S. P. Lyle*

A Proposed Schedule of Rental Rates for Farm Machinery — *C. B. Richey et al*

The Production Rating of Farmers Under Wartime Conditions — *F. J. Zink*

THE JOURNAL OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS



Strip Cropping
Raises Yields on Sloping Land

ooking down from an air-
lane you see here and there
new style in the garb of
lother Earth. In most areas
ou see checkered squares of
reen and brown and black,
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astures farmed the ordinary

etimes you see narrow, curv-
ripes that remind you of a
ade from the skin of a zebra.
s strip farming—first a few
of corn or other row crops,
strip of small grain or mead-
a rain the soil that starts to
rom cultivated rows does not
. When the run-off water gets
he close-growing grain or
it slows down and drops the
here is time for the water it-
soak into the ground. Soil
ter, seed and fertilizer all are
Yields are better, too.

The strips are curved because they "follow the contour." That is, they run along the side-hill at the same level, curving in or out to find that level. Once the strips are laid out, contour cultivation becomes easier than you would think. To be sure, there may be a few "point rows" or tapering lands. But this is balanced by the fact that your tractor always works on the level, never uphill with full load. From year to year you rotate the crops on the strips as you would in regular fields.

You can start strip-cropping and contour cultivation now, with the machines you have. Check-row planting and cross cultivation are not practical on the narrow, curving lands. Instead, you use the speed of modern tractor power to prepare a weed - free seedbed; to plant promptly; to nip new weeds "in the white" with harrow, rotary hoe or weeder. Accurate control of speed and steering with tractor cultivator, together with modern shields and sweeps, enable you to smother young weeds in the row with just the right amount of swiftly-thrown soil.

If you have a Case all-purpose tractor, you will enjoy its sure-footed performance on side-slopes, its quicker, easier steering, and especially its wide, unbroken range of field speeds to make every implement work at its best in every condition. Use your Case dealer's service to get all the economy and long life built into your tractor. See him about sweeps, disk hillers, or any accessories you may need for full efficiency in strip-cropping.

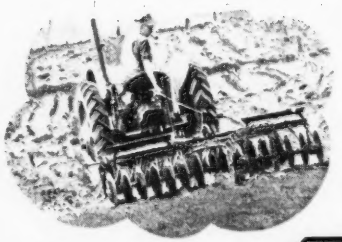
For methods of strip-cropping best suited to your local conditions consult the nearest representative of the Soil Conservation Service.

★ ★ ★

Strip cropping and contour cultivation are only two of many advanced practices which you can begin with your present equipment. Start them now and get experience for planning the purchase of new equipment when farm machines again are freely available. Send for your free copy of new booklet, "Win Against Water." J. I. Case Co., Racine, Wis.

Popular Harrow for Strip Farming

ıply pulling a trip-rope, the
Power Control disk harrow
and straightens on the go. It
no extra time or effort to
ıten the harrow at every turn to
eadlands level, or to cross sod-
ıterways without cutting. With
ers to tug at, no need for stop-
nd backing, a boy or girl can
this harrow easily.



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CASE

As a service to agriculture, this message will appear in several farm papers. It is one of a series urging farmers to adopt modern measures for erosion control and other advanced practices, using equipment they already have. J. I. Case Co., Racine, Wis.

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AGRICULTURAL ENGINEERING

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EDITORIAL

President Walker's Address

IN THE terminology of the day, there is a "directive" for the agricultural engineering profession in the address to the fall meeting of the American Society of Agricultural Engineers by its president, Professor H. B. Walker. We doubt if there ever has been a report on the state of agriculture so soundly factual in its premises, so objective in its analysis, so courageous in its criticism, and so inspiring in its call to duty.

Those of us who heard him in person have a new pride and a new confidence in the constructive leadership of the man we chose as our head for this year of war. To other readers we commend a careful study of President Walker's address, appearing as the leading article in this issue of AGRICULTURAL ENGINEERING. We commend it to editors and educators as worthy of widespread quotation.

Lesson from Britain

CONSIDERABLE criticism is heard, here and there, to the effect that we are borrowing too blindly some of the British war expedients. Though the Britons are too diplomatic to say so directly, some of them seem to sense this danger, and emphasize that conditions here may be so different that what is good for Britain may not be so good for America.

When Mr. J. A. Scott Watson, agricultural attaché of the British Embassy in Washington, told the fall meeting of the American Society of Agricultural Engineers at Chicago of farm machinery rationing procedure in England, he was careful to define the conditions as well as the methods, and cautioned that their methods might not fit our conditions. One point, however, would seem to have even more force in America than in England, due to our greater distances and greater diversity of crops, soils, climate, and practices. That point is the merit of local rather than centralized discretion.

He emphasized that while there is a central authority in London, it does not deal with detail nor make specific decisions. It does not attempt to apply a formula by remote control. Instead, all but broad policy is delegated to county committees of farmers and to local groups with little or no paid personnel. Instead of legalistic formulas which too often become fantastic in specific application, there is first-hand knowledge and common sense.

Though his subject was farm machinery rationing, we believe his emphasis on local discretion might well be extended to other things that affect the American farmer in his effort to do a war job. Local discretion should prevent such discrepancies as one reported from Iowa. Two farmers adjacent to the same city, served by the same rationing board and using the same kind of truck in the same kind of farming, took to that rationing board their ODT certificates. For the same period one was allowed five gallons of gasoline, the other 1800 gallons.

In such voluntary agencies as the Farm Bureau and the Grange, plus such official agencies as the county agricultural agent and the AAA committees, American agriculture has plenty of established organizations to carry out any reasonable farm program competently, equitably, promptly, and economically. Their major fault, if such it be, is lack of reverence for red tape and political expediency.

Welcome, Doctor Skinner

ANNOUNCEMENT was made last month that Dr. William W. Skinner had been appointed chief of the Bureau of Agricultural Chemistry and Engineering in the U. S. Department of Agriculture, succeeding the late Henry G. Knight. It is in the nature of a promotion, as Doctor Skinner had been associate chief of the Bureau for some years.

All members of the organized profession of agricultural engineering will join us we believe, in greeting the new chief with a warm welcome and in keen anticipation of great things to be done under his direction. He assumes his new responsibility as chemurgy, growing by rapid strides, puts new emphasis on the bond between the two branches of his Bureau.

More and more it becomes apparent that the miracles of the chemist must be wrought beneath an economic ceiling, the cost of raw material. To produce, to harvest, to transport, and to perform preliminary processing of agricultural raw materials at low cost is our job, and one we can do well in proportion as we work in close cooperation with the chemist. We look forward to effective leadership by Doctor Skinner and his Bureau.

Agricultural vs. Approved

LAST month the press carried a statement by Chairman McNutt of the War Manpower Commission urging all men to remain in college until called for military service, and stating that selective service boards had been advised that deferments until the end of the next semester would be given to certain classifications of students not already in the various reserves. Among them were "graduate students and undergraduate students who have fully completed one academic year of study in *approved* engineering curricula."

According to information from one of the state colleges, agricultural engineering is omitted from the approved list.

Just who tossed this monkey wrench into the machinery of food production we do not know. It could hardly have been anyone with an intelligent grasp of the herculean task assigned to American agriculture despite depleted man power and a machinery supply line practically cut off. Certainly there never was a time when agriculture stood so desperately in need of all the engineering assistance that can be mustered or trained to multiply the productivity of its waning personnel and equipment.

As an aid to straight thinking by the Army, Navy, War Manpower Commission, and any who have a voice in such decisions, we suggest that the armed forces, lend-lease, and the feeding of conquered peoples be allocated and limited to food produced over and above 70 per cent of the 1943 quotas; the same principle to be carried on into following years. Meanwhile it might be well for those in authority to ask Mr. Wickard whether the "approved" courses should include agricultural engineering.

George Washington Carver

America has lost a great scientist who worked at chemurgy before there was a name for it. In the fullness of years and of achievement he died, yet will he live in the heritage of research and of inspiration he left to his people and his country.

AGRICULTURAL ENGINEERING

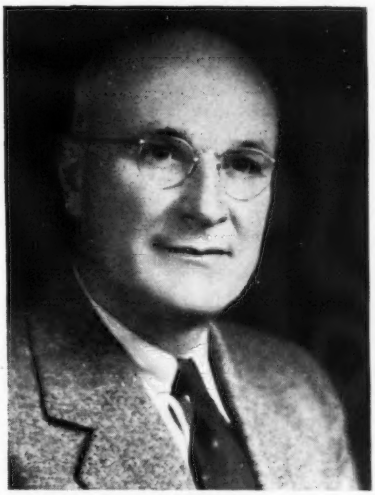
VOL. 24 JANUARY 1943 NO. 1

Agricultural Engineers on the Food Front

By H. B. Walker

President, American Society of Agricultural Engineers

ONE YEAR ago today a treacherous enemy plunged our nation into war. We choose now to call it a global war in which we have two distinct types of fronts. One is a military front and the other a food front. Both are fighting fronts, each related to the other. Each has problems of vital importance, which must be met in practical fashion, if we hope to bring this world conflict to a successful conclusion. We will win this war, on that point there is no division of opinion. The treachery of a year ago united our people to a common purpose in a way quite beyond the comprehension of our enemies, but in a way foreboding their defeat.



HARRY BRUCE WALKER

The outset of the war found our nation woefully unprepared to meet the issue on our military fronts. On the food front we were strong; we were well prepared, even to the point of overconfidence. Success in any type of warfare calls for men and weapons and initiative in action, whether this is for combat purposes, or for food, or both. On the military front, food is essential to sustain life to destroy other lives and property, in order that our enemies may be brought to submission. On the military front the fighting lines become continuously shorter with the approach of victory and the weapons used to kill and destroy become of diminishing value. On the food front, victory in combat extends the frontal lines and emphasizes the value of food production, for food becomes, in addition to a necessity for human sustenance, a powerful implement for peace.

Thus the objectives for the food front are broad and the responsibilities entailed are enormous, for we must supply food enough for our own fighting men and the fighting men of our allies, enough for our own civilians as well as those of our allies, enough to provide for those whose lands we occupy as we drive the enemy back, enough to take care of losses in transportation, and enough to create food stockpiles to win and write the peace.

We as agricultural engineers on the food front constitute the engineering corps for our food army. We have the duty and obligation to maintain the essential technical engineering services relating to land, labor, and equipment needed for this gigantic undertaking.

The past year has brought great improvement on our military fronts. We are infinitely better today in combat striking power than we were a year ago. Our military forces, immediately placed on the defensive by the treachery of a year ago, have for the most part now gained the initiative, and with our allies have become the aggressors. On our food front, however, things have not progressed so well. Where a year ago we had a well-organized, well-manned, and well-equipped food production plant, we have today a confused industry, very much undermanned, and with its equipment inadequate and on a submaintenance basis. It could be said with considerable honesty that American agriculture after its first year of battle is in retreat, faced with the abandonment of many of its normal weapons of production; largely cut off from its normal sources of supply and at the same time facing a wider food front than ever before.

Serious as the farm production situation appears to those of us long associated with the destinies of farmers, it is not much different than one should expect under the sudden impact of a war which has reached global proportions. We have been forced to arm and arm rapidly; we have had to assemble and train large numbers of raw recruits for combat duty; we have had to build weapons of war of many types and provide suitable ordnance for them; we have had to build ships and more ships to compete with a growing undersea menace; we have had to equip a large proportion of our fighting force for aerial combat; we have had to build roads, construct docks, and do thousands of other things not normal in peacetime activities. This has called for tremendous migrations of people, the diversion of materials to build things most urgently needed, and the translation of industrial plants to war work. Our achievements during the past twelve months provide ample evidence of our wartime abilities, even though these may be clouded here and there by errors in planning and execution, most of which could not be readily anticipated, but which in retrospect become interesting subjects for heated public discussions.

Under the pressure and excitement of preparation for combat warfare and the urgent need of equipment to put our fighting men on a comparable footing with our adversaries, it is not surprising that a vigorous industry like agriculture, important as it is, should be temporarily forgotten and left to shift for itself. Surely that has been the case during the first year of the war. Those of us who serve agriculture have felt this keenly and we have championed, largely without result, the cause of those on our retreating food front. If agriculture had not gone into the war period as a vigorous industry, it could hardly have survived the neglect and handicaps heaped upon it during this first war year. Fortunately in 1942 Nature was on our

Address delivered December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. Author: Head, agricultural engineering division, University of California.

side for crops throughout the nation are, for the most part, of unprecedented quantity and value. But, I repeat, agriculture during the first year of the war has started a retreat, at the moment quite orderly, but which might become a rout unless the need for proper reinforcements is recognized by our government.

In this retreat, it is proper to abandon certain nonessentials, but in our haste to produce war materials for combat purposes we may be seriously jeopardizing essential sources of goods and services required in the holding of our lines on the food front. Farm equipment order L-170 issued on high government authority in the general public interest and to promote the national defense, due to its restrictive nature, stands as a warning signal for further agricultural retreat.

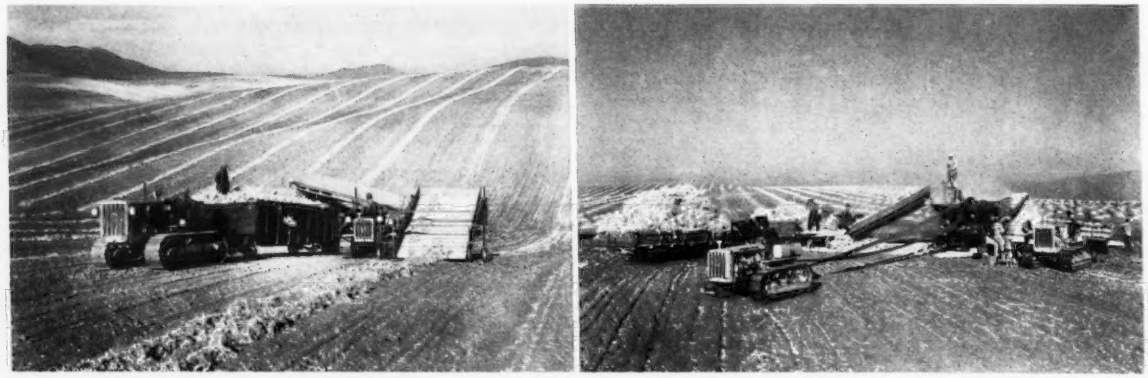
It is a distinct compliment to the efficiency and organization of our larger farm machinery and equipment manufacturers to have our government take over practically all of their facilities to produce military goods and supplies. Judging from the quality and quantity of their output to agriculture heretofore, they can and no doubt will make splendid contributions to our needed war goods. On that score there can be little difference of opinion.

The effect of this change on agriculture is quite another matter. In our threatened retreat on the food front we are asked to practically abandon our established and highly dependable sources of new farm equipment coming from these larger manufacturers. It is to be hoped, for the sake of agriculture, that this drastic change will not eventually jeopardize supplies of repair parts for machines distributed by these agencies in previous years.

The fact that most of the new machines in 1943 must come from manufacturers of less volume importance introduces problems of distribution for which no satisfactory answer has as yet been offered. This problem adds to further confusion among farmers and the established agencies serving agriculture. It is unnecessary to enlarge upon the complications of this phase of the problem to this group, but what is more disturbing at the moment is the effect of the recent order on farm machinery service agencies. The improvement in Class A and Class B dealerships during the past decade has caused farm communities to rely heavily upon them for services and repairs, particularly those agencies representing the older full-line companies. This order leaves these dealers largely without supplies of new machines, and they are faced with limited, but may we hope adequate, supplies of repair parts to keep in operation old machines, many of which under normal circumstances would be classed as unserviceable. Furthermore, this local dealer is now responsible for much of the rebuilding and shop repair work of his community which he is asked to meet in some way under keen competition for skilled labor. In any retreat along our agricultural food front, we should not abandon the local implement dealer. Crippled as he is by the impact of Order L-170, he must not be permitted to become a permanent casualty, for he has a place with the shock troops in our battle of "food for freedom". As engineers it is our duty to assist in every way possible to keep this service of supply effective for our food fronts.

There are some farm practices which have been introduced under peacetime conditions which may be abandoned during wartime, without losing fundamental values. For example, the shipping of fresh carrots with tops attached, the gas treatment of English walnuts to produce light-colored meats, the size regulations on various types of fruits, special packaging of products to meet the desires of luxury buyers, the dry feeding of animals when pasture feeding might be more economical of labor and equipment, the sacking of grain and seeds when bulk handling would answer—these are just a few of the nonessential practices in agriculture, which in wartime might be eliminated, since they require labor and materials which add but little, if any, to the final wartime value of the products.

It is well for us to be realistic in facing the facts regarding the shortage of equipment in 1943 and then proceed to do everything possible to obtain maximum production from what we have. In Great Britain farmers have been urged to operate their tractors at optimum loads. The better and larger farm units of our country are doing that very well, and in this connection it is well to remember that 50 per cent of the farms are the producers of approximately 90 per cent of our marketable farm products. In war, however, particularly when labor and equipment are insufficient to meet farm demands, an analysis of the operations of the 50 per cent of the farmers producing only 10 per cent of our marketable products seems to be in order. Should we classify farms for efficiency of production as has been done in Great Britain? Should inefficient farmers be permitted to wear out equipment which could be used more effectively by others for the production of food products? Many of these farm units, in the interest of our food front, might well be abandoned and the equipment and personnel transferred to more competent managers, or perhaps their equipment might be pooled for more effective use under some form of centralized management. To do these things is not in line with our usual ideas of free agricultural enterprise, but our nation has assumed the obligation to produce food for all people seeking freedom who may be in want and need our help. Morally then, as well as from a military standpoint, we dare not



Harvesting (left) and threshing (right) lima beans somewhere in California

retreat from our food front until every effort has been made to hold up production. It is to be hoped such matters will be duly considered in making allocations of our limited supplies of new machines in 1943. Surely if food is the ultimate goal, machines will be made available first to our most efficient farm operators.

The lend-lease idea in the use of farm equipment is gaining ground. It is a practical idea to help meet the emergency of equipment shortage which should be fostered by agricultural engineers. On the larger farms this may not be so important, but smaller operators can profit by the lend-lease idea. Our Society has taken a forward step in making a study of farm machinery rentals. Such rentals should be fair both to the lessor and the lessee. In this connection, rental bases should take into account that the earning power of a farm machine in wartime is much above the average for the life of the machine and such earning capacity should be reflected in the rental rate.

Labor was the outstanding bottleneck of farm crop production in 1942. Many criticisms have been made of the farm labor situation ranging from actual scarcity of workers to a lack of work hours by those who were available for farm work. No matter what the cause may have been, farmers were unable to obtain help when they needed it and this shortage has created a number of important problems requiring the thought of agricultural engineers. A few of these will be mentioned as examples.

IT IS THE DUTY OF ENGINEERS SERVING AGRICULTURE TO CONSERVE FARM LABOR

It is our duty as engineers serving agriculture to exhaust every opportunity to conserve labor in this food for freedom battle. Man-hours per unit of output is the controlling factor. We must change our thinking to fit this new condition in war economics. Moreover, we must change our thinking to person-hours of work for we have today the added problem of adapting equipment to such labor as may be available. In many cases these workers will be women and children, or older persons, not regularly employed under peacetime conditions. To adjust or modify a machine, or carry out an operation, which will make possible the full utilization of these lighter labor types is, in wartime, just as important an engineering achievement, or even more so, as to reduce costs per man-hour of input during peacetime.

We should be ready to make detailed and searching studies of labor-saving possibilities in agriculture under the restrictions war imposes. The fact that we feel neglected and abused by government regulations does not justify an attitude of unwillingness upon our part to do our utmost to hold our lines on the food front. On the other hand, these constitute a challenge to our ingenuity and resourcefulness. This in no way implies that we should not seek corrections for severe restrictive measures, but while corrections are being sought there is much constructive and productive work we can and should do.

The loss of skilled and experienced farm help contributes to the vulnerability of our food front. The man-hour requirements for crop production are increasing. This is due to the character of the available labor supplies. These labor requirements will be higher in 1943 than they were in 1942, and the increase of 1942 over previous years has been for some operations as much as 25 to 100 per cent higher. This is not due so much to lack of interest upon the part of farm workers as it is from lack of experience. A tractor driver, for example, is not developed in a few days. It takes weeks of time, working in many crops under variable soil conditions and with different implements, to develop proficiency in operation. Yet someone must drive our tractors. Unfortunately agriculture cannot meet this situation like other war industries. A recent announcement of the University of California states "the men and women trainees receive $100.00 per month during the twelve weeks full-time training classes." These classes are in aircraft design. An advertisement in a West Coast paper seeks students to learn welding for which they will be paid 95 cents per hour while learning.

Agriculture has no arrangement to subsidize those who need training to perform farm work. There is no "cost plus" basis for farm crops. Workers must be sent to the field in most cases to get along as best they can. This means lowered output, some injury to crops, often damage to implements, and always lower duty for the equipment. Such advance training as is practicable should be organized. The vocational agricultural schools no doubt are in the best position to conduct this preliminary training, and they have funds to pay instructors but they can't pay students to attend. With the present scarcity of equipment it is difficult to obtain implements and parts to motivate the instruction.

AGRICULTURAL ENGINEERS HAVE A DIFFICULT PROBLEM AND MUST FACE IT REALISTICALLY

Here again agricultural engineers are faced with a difficult condition and our approach to the problem must be realistic. We must anticipate loss in machine efficiency and greater demands for repairs. It also means that we should develop changes in equipment and add such safety devices as may be desirable to meet the requirements of the labor to be utilized. At best, difficult situations will develop, but with the determination to make the most out of conditions as they are, we can contribute more to the food program. This attitude does not infer that we should uncomplainingly submit to regulations and restrictions which, to us, appear to be a detriment to our workers on the food front.

In fact, the tendency upon the part of government during the past eighteen months to issue regulations which prevent the development of new labor-saving devices does not seem to be in the public interest. Under present regulations we are limited in equipment on the basis of what we had in the past. Production of agricultural equipment on a decreasing percentage basis not only throttles new ideas, but it likewise weakens our efforts to produce food. In these times when manpower is one of the chief bottlenecks in every wartime program, every effort should be made to promote and put into use potential labor-saving equipment. As engineers in agriculture we should not hesitate to analyze every operation on an efficient man-hour basis, and where equipment will reduce man-hour requirements, we should point out the savings in labor in terms of the critical materials involved. To do otherwise would be neglect of our engineering duty.

In a democracy overemphasis in some phase of a public problem is likely to occur during national stress. In our present zeal for building ships, planes, and weapons of war, we may have failed to adjust our national economy to meet the all-out requirements of war. While we have been building up the arsenal side of our war effort at an amazing rate, we have been quite indifferent, so it seems to me, as to the true situation regarding our farm production units. Agricultural surpluses from past years and a bountiful Nature in 1942 have not helped to arouse public consciousness to the true situation. Yet a view of the food stocks on the shelves of our local grocery stores should be a reminder of the diminishing supplies of foods for local consumption. At the same *(Continued on page 10)*

Farm Structures Prefabrication

By J. Dewey Long
FELLOW A.S.A.E.

THE prefabrication of farm structures is one of the most important challenges currently facing agricultural engineers. It is no new construction science; it requires no special materials. It does offer a simple, business-like arrangement whereby farmers can secure at least the smaller production structures they need, with the advantages of advance selection of design and materials, moderate fixed costs, and immediate delivery ready for use. It is essential that farm structures engineers recognize the principles, current growth, and future possibilities of prefabrication, and adjust their activities to best accord with the changing situation.

Fundamentally this new trend consists of advance construction operations performed on common material units and shapes. The use of power tools and jigs speeds these advance mechanical operations, and the fabricated products greatly expedite final erection at the building site. All of the common farm building materials have been used in farm structures prefabrication. Techniques and systems vary according to the specific requirements of the job and the nature of the materials.

During the past two years the possibilities of prefabrication in the construction industry have received marked attention, due to the many and diverse types of examples brought to public attention.

A large number of housing projects, commercial and industrial structures, cantonment and other war-use buildings have been prefabricated, many of the latter on the site to expedite construction. Considerable publicity has been accorded Henry J. Kaiser who has used prefabrication as the chief means of securing his dramatic speed in ship building. The USDA Commodity Credit Corporation has purchased large numbers of prefabricated grain bins, first those of steel because the steel fabricators were equipped for the large-scale production which permitted low costs, and this year lumber, plywood and insulation board bins.

Less spectacular are the prefabrication activities of numerous retail material dealers, especially those in rural Midwest areas. Some dealer trade papers which have been sponsoring the idea estimate that about 50 per cent of the dealers in this area have prefabricated hog houses, poultry brooder houses, grain bins, and similar farm items in their yards this year. One of the three dealers in a small northwest Kansas county-seat town kept a yard construction crew busy continuously from December to last September, turning out 52 grain bins along with numerous other items. At the peak of their grain bin business the dealer was employing 17 carpenters. One of the large wholesale lumber concerns designed and made available to retailers jigs upon which lumber grain bins of a standardized design could be built. A Texas milk inspector is reported to be collaborating with a retailer-builder in distributing a prefabricated milkhouse and milking barn meeting the sanitary requirements.

A considerable number of operators, with farm structures prefabrication as a major or sole activity, has been established for some years. One of these, established for 20 years in a small, western Iowa town had a crew of 175 men working on hog and poultry houses last March. He had "been off the market" for seven weeks, as slow material deliveries and restricted labor supply had not enabled him to keep production up to demand. Several of the established house prefabrication concerns are considering the farm field as a desirable diversification for their activities.

Since the term "prefabrication" is commonly used to include all pre-erection fabrication it includes several different techniques. Of these, the systems commonly applied to the farm field are as follows:

1 *Precutting.* Individual pieces of material shaped to fit directly into the structure. This avoids some of the most time-consuming hand operations at the site, but requires care in proper selection and identification of the pieces in the field.

2 *Prefabrication.* The most commonly used system; individual material pieces shaped, and then assembled into panels and structural parts for direct use. This permits use of power equipment and labor-saving jigs in the shop where all operations can be planned at a height and angle where the mechanic's labor can be most effective. The prefabricated panels store readily in minimum space, and make the most effective use of shipping space. They can be made of a size to fit best the transportation medium and size of erection crew, reducing field joints to a minimum.

3 *Preassembly.* This is essentially conventional construction in the shop or dealer's yard of structures small enough to truck *in toto* to the farmstead and set down on the foundation. This reduces field labor to an absolute minimum. In some instances structures too large for one-piece shipment may be divided into two or more sections. A good illustration is a special order of 100 small houses currently being fabricated in northern Indiana and transported 700 miles into the Tennessee mountains. The houses 16 by 24 ft are completely finished and furnished at the factory. Divided down the center, each half is light enough to be handled by two men and towed on a small trailer behind an automobile. Within an hour or so after the arrival of the second half at the site all utilities have been connected and the house is ready for occupancy.

All three prefabrication systems have the following advantages in common:

1 Encourage better selection of materials for specific uses in the building

2 Permit use of accurate, labor-saving shop equipment

3 Permit shop fabrication under more comfortable and more effective working conditions than are frequently experienced in conventional construction

4 Stop haulage of unnecessary and waste materials

5 Displays maintained by fabricator or his salesman permit farmer selection of structure which most exactly meets his requirements, wishes, or pocketbook. Some dealers report their sales to be directly proportional to the size of their display

6 Design is controlled by the fabricator, presumably with qualified reasons, rather than left to the whim or tradition of the country carpenter

7 Economies in selection and utilization of materials and in labor result in lowered *(Continued on page 10)*

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Confinement System of Producing Pork

By E. L. Hansen
MEMBER A.S.A.E.

AMERICAN farmers have a big job ahead in 1943 to meet the production goals set by Secretary of Agriculture Claude Wickard. Farm production in 1942 set an all-time high, but in 1943 farmers are asked to produce even more. In 1942, 105 million hogs were marketed, the largest crop in history. The 1943 production goal is 15 per cent above this, or about 121 million head.

Present production may be stepped up by any one or all of the following ways: (1) Keep more sows; (2) feed to heavier weights, or (3) adopt better management practices thereby getting more pork in a shorter feeding period. Obviously the last one will appeal to most farmers seeking more efficient practices in producing pork.

The possibility of increasing production by better practices is apparent when one considers that a national average of one out of three pigs farrowed dies before reaching market; in states of dense hog population this loss runs over 40 per cent. Studies indicate that every pig at weaning time represents an expenditure of approximately 290 lb of feed. The loss of these pigs represents a tremendous waste that can be largely prevented.

Swine authorities say this heavy loss is due chiefly to a lack of sanitation. Soil becomes infested with disease germs and parasites which cannot be eradicated, and if hogs are allowed to run on this infested ground, they are almost certain to become infected. Internal parasites take a big toll. Besides killing many hogs, the 1942 USDA Year Book of Agriculture states that "Much of the loss from internal parasites is indirect, taking the form of stunted growth, ill health, reduced production, and condemned meat products; but conservative estimates indicate that these parasites rob the country of at least 125 million dollars a year. It has been amply proved both in experimental work and farm practice that these losses can be sharply reduced by effective medication and the use of sound control measures, including good sanitation especially." This is confirmed by a study made at the University of Illinois which revealed that on 17 farms raising pigs both by sanitation practices and by ordinary methods the "sanitation pigs" averaged two more raised per litter. And on 40 farms with severe losses in previous years litters raised under sanitary conditions averaged 2.7 more pigs.

Only 1 per cent of the pigs raised under the sanitation method were runts whereas 18 per cent were runts under the other methods. They reached market weights seven weeks younger and they made 100 lb of gain on one-fifth less feed. These hogs were raised on clean ground. Many farms no longer have clean ground on which to raise hogs, and many farmers do not practice the clean ground system even when it would be possible for them to do so. (When using the clean ground system sows and litters are hauled to pasture and feed and water are supplied to them there.)

The foregoing examples show the importance of strict sanitation. Concrete floors in farrowing pens have long been recommended because they could be sterilized and kept sanitary. More concrete feeding floors are being built this year than ever before to keep hogs out of the mud and to save feed and labor.

The length of time that pigs are kept in a farrowing house or on a concrete feeding floor depends upon the individual hog raiser. Some haul the pigs to pasture just as soon as possible. Others keep pigs on concrete until after weaning, take them to pasture until ready for fattening, then bring them back, while still others keep them on from farrowing to market.

The many different layouts of buildings and equipment used by farmers raising hogs on concrete indicate that the system can be adopted by renters and owners alike. In many cases no additional facilities need be built. In others only a concrete feeding floor is needed. Renters often find that a landlord will build a concrete feeding floor before he will build hog-tight fences. The farrowing houses vary from small individual houses set around a concrete floor to large heated central houses. When new feeding floors are needed the materials are usually available locally and farm labor can be used to do the work. Hogs confined to a concrete floor should have from 10 to 15 sq ft of floor space per hog. To provide drainage the floor should slope one inch in 4 ft. Facilities for holding the manure until it can be hauled away do much to keep the surroundings sanitary.

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These two views illustrate the confinement system of producing pork. (Left) These hogs have spent their entire life on a clean concrete floor. They averaged 268 lb in 5 months and 3 weeks. All they had to do was eat, sleep, and grow. (Right) This shows a feeding floor after a heavy rain. Hogs are not naturally dirty and should not be forced to eat in filth. Hogs shown here have spent their entire life on this floor.

A small gutter along one edge of the floor outside of the fence is quite satisfactory.

John Hendriks, West Liberty, Iowa, has been raising hogs on concrete from farrowing to market for many years. His hogs will average about 275 lb in six months on 300 lb of feed for each 100 lb of gain, and he markets an average of nine per sow. Large litters like this are significant when one considers the statement made by L. A. Weaver, hog specialist, of the University of Missouri, that a sow must raise five pigs per litter to pay for her keep.

Many other farmers in Illinois, Iowa, Minnesota, Kentucky, Indiana, and other states are very successful in raising hogs confined on concrete.

Good hog farmers who want to do a better job of raising hogs find that this system offers them an opportunity to exercise complete sanitary control. They know that the only spot on the farm that need be kept clean to prevent hogs from becoming infected is the small concrete floor, and this can be done. The amount of labor required to do this depends upon the individual layout. Some have water under pressure which not only makes it easier to clean the floor but eliminates the labor of hauling drinking water. Also the handling of feed and manure can be done mechancially if some thought is given to the plan from the labor-saving standpoint.

The experience of numerous farmers in recent years shows that it is possible to provide all of the minerals, etc., needed by a growing pig when confined. Farmers have taken a rational approach to this problem. Soil and sod taken from fence rows, where hogs have never been allowed to run, is given to small pigs to provide minerals that are ordinarily gotten from the soil. Plenty of leafy alfalfa meal or even hay is provided along with the minerals. Besides balanced rations of homegrown feed and protein supplements are fed.

SUMMARY

1 A large increase in pork production is needed in 1943.

2 Saving only half the pigs which now die between farrowing and market would make it possible to attain the new production goal.

3 Losses can be greatly reduced by proper methods of sanitation.

4 Many farmers are raising hogs on concrete in order to control sanitation and at the same time conserve feed. Some farrow their pigs on concrete, take them to pasture for awhile, then fatten them on concrete. Others keep their hogs on concrete from farrowing to market.

5 Expensive construction is unnecessary. Many farmers are making use of buildings and feeding floors already on the farm. Others need only a concrete feeding floor.

6 Faster, cheaper gains are reported by hog farmers who make use of concrete. One farmer obtains the high average of 275 lb per hog at six months of age with 300 lb of feed for each 100 lb of gain.

Farm Structures Prefabrication

(Continued from page 8)

costs to the purchaser, or superior quality at the same cost level. The price, also, is definitely determined at time of purchase with none of the unforseen extras frequently experienced with conventional construction.

It is not the author's wish to create the impression that prefabrication *per se* is a guarantee of perfection. Errors may occur in all three major phases of material selection, development of satisfactory design, and adequate workmanship. Inexperienced fabricators especially will require the guidance of qualified agricultural engineers.

Such guidance and counsel must consider the structural requirements of prefabrication as well as the utilization requirements. The latter require clarification and standardization from the present state of our agricultural housing science. This need prompted the recent request of the Farm Structures Institute addressed to federal and state agricultural engineers and animal husbandrymen for basic factual data, or at least reasonable agreement on the housing requirements of dairy cattle, hogs, and poultry. This information, expressed in fundamental terms, is essential to the progress of prefabrication.

That public service institutions and specialists are warranted in devoting attention to the prefabrication field is indicated by a recent statement by a northern Illinois fabricator. Already this season, he stated, he has contracts for 1200 poultry brooder houses. It is extremely unlikely that any college plan service can take credit for a similar number of actual structures built by conventional construction in any one season. Recognition by the colleges of the opportunities in this field should result in the preparation of plans designed for prefabrication, reasonable cooperation with commercial operators, and even short-courses designed to interest fabricators when economic conditions warrant.

It may safely be stated that prefabrication in the farm field is here to stay. It will not supplant conventional construction, but it will prove a worthy competitor in some items of farm construction because it renders a distinct service to the farmer. With all due regard to the fact that many farmers may continue to do their own construction work, many others have already demonstrated their approval of the advantages prefabrication offers.

Prefabrication is already writing farm structures history!

Agricultural Engineers on the Food Front

(Continued from page 7)

time, however, our government agencies continue to hold out the "horn of plenty" to all who will join us in our war against the Axis.

Secretary of Agriculture Wickard in a recent statement said, "It is a political necessity that starvation disappear in any country we occupy. We must see to it that populations delivered from Axis bondage are given a real deliverance, for they have been told many times by our enemies that democracy means freedom without bread. We must be ready to send the essentials of life with our troops, or right behind them."

Thus we have a "Food for Freedom" campaign backed by the highest motives idealism can provide, but it takes more than idealism to produce food. It takes land, labor, and equipment in a balanced combination. Cows that are slaughtered no longer give milk; food that rots in the field doesn't satisfy hungry humans; machines that are broken or worn out are no longer labor-saving devices for food production; factories whose production is translated from plows to cannon do not contribute to the food stock piles needed to win the peace. Yes, there is a food front in this war which merits our all out support. Truly, it is a "Food for Freedom" campaign, but it would be sad indeed if our nation should underestimate the appetite of Freedom.

The thought I would leave with you on this, the anniversary of our first year in the war, is that regardless of the difficulties we may be called upon to face in our battle on the food front, we must keep on fighting, using our technical knowledge to the fullest in keeping farm machines rolling in the fields to produce every pound of food possible for the war effort, and to create the much talked about stock piles for writing the peace.

Farm Machinery in Britain's Food Production Effort

By J. A. Scott Watson

BEFORE dealing with the particular subject that I have been set I must say a little about the general aims and methods of Britain's wartime food production program.

The general lines of policy had been worked out before the outbreak of hostilities. It was decided that there must be a large increase in the cultivated area, partly by the reclamation of waste land and partly by the plowing and cropping of pastures, excluding, however, pastures required for our dairy herds. The grass lands to be broken up were of many widely different types, from very rich steer-fattening grass to very poor or exhausted land, some of which in fact was classified in our agricultural statistics not as pasture but as "rough grazing" or "mountain and heath land used as pasturage". Some of these pastures were ready for the plow in 1939. In other cases the clearing of scrub, the renovation of the drainage system, or the application of lime was necessary before cropping could be wisely attempted. Naturally, where much preliminary work was required, the actual cropping had to be postponed for a year or more.

The particular crops that were given priority were wheat, other small grains, potatoes, sugarbeets, and certain vegetables.

The total increase in the cultivated area, during the first three years of war, was 6 million acres, representing about 50 per cent of the original area. The increase in the potato acreage has been 66 per cent, which explains the increased need for row-crop equipment and specialized potato machinery.

The task of carrying through the general program on the individual farms was placed in the hands of county war agricultural executive committees. The members are not elected by the county's farmers nor are they intended to represent farmers. They are selected and appointed by the Minister of Agriculture and through him are responsible to the British Government. In other words, they are servants of the nation. The farmers work under the committee's orders.

The committee has, however, many other functions than that of handing out orders to plow this or that field or to produce so many acres of wheat or potatoes. It controls the distribution of feed and fertilizers. It controls farm labor—i.e., it has the duty of saying which particular farm men may go to the forces, and who must stay on the farms. It organizes substitute and seasonal labor, and it works in close collaboration with the county office of the women's land army. It is responsible for seeing that efficiency is maintained on the farms. Another of its important functions is to control supplies of farm machinery and to see that the available machinery is fully used.

Machinery problems are handled by a special subcommittee which has one or more paid machinery officers. It is the duty of this committee to make an annual estimate of the amount of new machinery that is essential to the carrying out of the county's program. When doing so it has before it the applications that farmers have made for permits to buy tractors, binders, combines, and so on. Each application will have been reported on by a district advisory committee. It also considers the needs of its custom-work contractors and of its own machinery pool.

This machinery pool consists of equipment that is owned by government, and which is under the complete control of the committee. In a typical county containing some 200,000 acres the pool might contain a hundred tractors with appropriate numbers of plows, cultivators, disks, seeders, binders, separators, and so on. The number of government-owned tractors is about 7 per cent of the total in the country. But in counties of small farms, or of farms with small areas of cultivated crops (i.e., in mainly pastoral districts) the size of the pool will be proportionately large. By contrast, in counties of large farms, which can provide full employment for one or more tractors, the bulk of the necessary equipment will be owned by farmers themselves and the county pool will be relatively small.

In a majority of cases the whole of the pool equipment is actually operated by the committee's own employees, and carries out custom work for farmers at fixed rates. The following is an example of the rates which apply:

List of normal charges for cultivations — Scottish County War Committees, 1942/43

(£1 = $4)

Plowing	
Two to four bottom plow	
Sod, 4 years old or more	$5.20
Sod, under 4 years old	4.60
Stubble, etc.	4.20
Single-bottom tractor plow	
Sod	7.00
Stubble	6.20
Harrowing—each stroke	.60
Cultivating	1.60
Heavy grubbing	1.80
Disk harrowing	
First stroke	1.80
Each subsequent	1.20
Seeding grain	1.20
Seeding grain and fertilizer	1.80
Distributing fertilizer	1.20
Rolling	.70
Row-crop work — Cultivating	1.80
Listing or splitting	2.20

The organization is simple. A typical county might have four or five machinery centers, at convenient points, each under the charge of a foreman who has the services of a mechanic and facilities for machinery overhaul and minor repairs. The foremen are of course responsible to the machinery officer. The machinery center may, if its mechanic has time, carry out urgent repairs of farmer-owned machinery.

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There are two modifications or variations of this plan. In Devon, a large county of small farms much broken up by hill and valley and with very narrow roads, the bulk of the committee's machinery is leased to small contractors who were in the custom-work business before the war or who have been encouraged to start since. Some are also farmers or implement dealers; others were one-man businesses where the whole stock-in-trade was a single tractor and a few implements. These people have been encouraged, as licensed contractors, to increase their business. This system is appropriate to the local circumstances, and has been adopted in parts of many other counties.

The second variation is that some committees are prepared to rent implements—disk harrows, binders, etc., but not tractors—to farmers who have the necessary horse or tractor power.

FORMATION OF HELP-YOUR-NEIGHBOR GROUPS IMPORTANT IN CASE OF SMALL FARMS

Let us now turn briefly to voluntary organizations for mutual help. Farmers of course have been accustomed to lend each other implements, and generally to help each other out of difficulties. The only change that we have made is to get this "neighbor help" on a better organized basis. We work in very small units, the parish being generally convenient. A typical parish might contain 20 or 30 farms of varying sizes. The formation of a "Help your neighbor" group is of chief importance where farms are small. A committee of three or four (one of whom may be a contractor) is formed, and these choose the best available man as secretary. A census is made of the available machinery in the parish with an indication of the extent to which each owner uses each particular machine,—e.g., a note is made that John Smith has a binder in good condition, and only 40 acres of small grain. The farmer who foresees the need of a particular implement, or is held up by a breakdown of a machine, calls up the secretary, and the likeliest sources of the necessary loan are explored in turn. If the effort is fruitless, then the nearest custom-work contractor or the local machinery center of the county committee is contacted. Needless to say the whole success of the scheme depends upon the efficiency of the secretary and the amount of time he can give to the work, especially during the peak-labor seasons. Some "neighbor help" committees have made standard rates for hire, and the secretary produces a set of accounts.

May we now turn briefly to the control of the purchase of machinery by farmers. If a farmer thinks that he needs a new tractor, binder, or other implement which has been placed on the permit list, he applies to his county committee on a prescribed form. (We have a lot of prescribed forms.) The machinery officer will generally submit the application to the farmer's district committee, who will send two of its members to ascertain the facts. The machinery committee then gives each application a priority rating. "A" means either of two things, viz. (1) that there is full work for the implement in question on the applicant's own farm or (2) that the applicant is willing to register as a contractor, and that there is full work for the implement on his own farm and those of his neighbors. A registered contractor must carry out work for other farmers at prescribed rates, and his license (and the implement) will be withdrawn if he fails to give reasonable service. There are "B" and "C" priority ratings, but it is very rare for a "B" priority to produce any response.

I can refer only briefly to a few miscellaneous aspects of the problem. County committees sometimes assist in the training of tractor drivers, though this is more generally done by special training centers, including women's land army schools. The committee prepares machinery notes for circulation to farmers, or for publication in county newspapers. It is part of the functions of the machinery officer to see that his local dealers are kept supplied with spare parts, and to arrange, if necessary, for the redistribution of inventories. If a dealer applies for the reservation of a mechanic who has reached military age, the machinery officer will be consulted in the matter. If a farmer complains about the service that he has received from a contractor, the machinery officer will inquire and report to his committee. Some committees organize courses of instruction in repair work, including welding.

Finally some progress has been made in streamlining our British implement machinery industry. There have been many difficulties, arising partly out of the urgency of our needs—for instance, it has been necessary for many small plants to concentrate on cultivators, etc., in the fall (because cultivators were required for the following spring) and to turn over in winter to hay-making machinery because hay machinery was urgently wanted for the summer. Some considerable good has been done, however, by reducing the number of models particularly in the case of plows.

I cannot close without conveying the gratitude of our British farmers to you gentlemen of the American implement industry. We have honestly tried not to ask for anything unless it was truly required, and was of clear advantage of the war effort as a whole. The equipment you have sent us has made possible a really important saving of shipping. Indeed it has been calculated that what you sent us so promptly in the first months of the war has already produced more than twenty times its own weight of food, which would otherwise have had to be imported. Even where your supplies have represented only a small fraction of the total, they have often been vital to our program. Take tractors, for example. I believe we have made over 65,000 in Britain since the war started, and we have imported only 23,000. But we make no crawlers and no row-crop models in Britain, and both of these were really essential for some of the jobs that had to be done. I want to assure you that in the British countryside there has been no "leak in the reservoir" of goodwill towards your country.

"The Case for Agricultural Engineering"

ONE may well raise the question as to why there is need for the agricultural engineer when there are so many other kinds of engineers available whose techniques are used by agricultural engineers. . . . From its beginning as a technical profession agricultural engineering has . . . . perhaps been somewhat unorthodox in some respects. For instance, the average structural engineer would not countenance the design or erection of a statically indeterminate structure. The agricultural engineer who first encountered one probably did not like the idea either, but the needs of hay and crop storage, as well as the existence of certain difficult precedents and traditions, forced him to accept it until he could provide something better. In fact, there were existing farm structures of this character built by skilled artisans with obvious disregard for structural economics but which had stood the test and stress of time, weather, and service fairly well. The agricultural engineer simply gulped and added a few members at the right places so that the structure fitted the laws of graphic statics, and thereby saved his face and the faces of a lot of structural engineers. So far as I can learn no members were ever substracted.—R. W. TRULLINGER *in "Scientists Face the World of 1942".*

Nation-Wide Farm Equipment Conservation Program

By S. P. Lyle
FELLOW A.S.A.E.

CONSIDERATION of the aspects of the 1942 - 43 nation-wide farm equipment conservation program starts with the fact that we are at war. A year ago we entered the war in defense of freedom and democracy. A year ago yesterday Axis invaders bent on world conquest attacked Pearl Harbor while proffering proposals for amity in Washington. Our military might is now in this fight to win, supported by our unequaled industrial strength and vitality and a self-reliant agriculture producing the food for freedom "which will also write the peace."

Secretary Wickard has said the "United Nations' strategy calls for the use of food as a weapon of liberation to build ever-increasing power against the Axis". America next year, in addition to meeting domestic requirements, must supply at least one-fourth of its expected production to a United Nations' pool to feed military forces and civilians. This is double the amount that went into this year's pool. The agricultural war products, of course, are not limited to food. The goals call for sharp increases in the output of meats, dairy and poultry products, peanuts for oil, corn for feed, long-staple cotton, dry beans, peas, and potatoes, while reduced acreages of wheat, short-staple cotton, and other crops, of which present supplies are large, are requested in order that such land and the labor involved may be released for more essential production. Farmers face a war task in 1943 to exceed the record-breaking production of 1942 with less labor, machinery, and supplies. Farmers will no doubt work harder in 1943, but in return will probably receive the largest farm income in the history of this nation.

With reference to farm labor, Raymond C. Smith, chief program analyst, Bureau of Agricultural Economics, USDA, made the following outlook statement in October: —"If present trends continue, agriculture probably will lose a million workers from its labor force between July 1, 1942, and July 1, 1943. By October 1, 1943, the end of the harvest season, the prospective loss will amount to 1,300,000 workers. At the same time, needed agricultural production next year would require 200,000 more workers than were available in 1942. To meet these needs to the full, next year we would have to recruit 1½ million new workers." Mr. Smith estimates that if this is done "the 12,200,000 agricultural working force on October 1, 1943, would be constituted as follows:

"9.1 million persons over 14 years of age living on farms. (About 20 per cent of this number would be women and about 20 per cent of all farm women would be working in agriculture)

"1.4 million persons who do not live on farms but who will be working in agriculture

"1.0 million persons living on farms working chiefly at non-agricultural work who will do some farm work

"0.7 million children under 14 years of age."

To this estimate he adds: "But there is also another important source of farm labor. This is the reservoir of under-employed farm operators, who because of limited land, limited operating capital, lack of knowledge, or for other reasons are producing very little for the market. About 2 million farms, or one-third of those reported in the 1940 census, reported gross incomes of less than $400. About half of the production on these farms was consumed on the farm and on the average these farms sent only about $100 worth of products to the market. This third of the farms produced only about 3 per cent of the marketed crops. There are also many under-employed farm operators in the middle third, those who reported gross incomes between $400 and $1,000 and who contributed only 13 per cent of marketed crops."

This statement discloses, in addition to the imminence and magnitude of the farm labor problem, two important facts relating to the conservation of equipment; first, the recruitment will come from persons who are inexperienced in the use of farm machinery and equipment, and, second, the agricultural production load of the nation is carried principally by one-third of the farms. That is, one-third of the farms produce 84 per cent of the marketed crops.

With reference to the first factor, it is obvious that recruits, even those who are farm reared, will have to be taught by the farmers using their services to do new farm tasks which involve success in mastering new crops or other farm practices, skill and conservation in the operation of machines, and the safety of persons and protection of property from accident. Farming tasks and chores change continually with the seasons and are usually done without immediate supervision. This is especially true of the operation of modern field machinery. And, since no two years are alike in weather, marketing, and management, even a year of experience does not develop the dependability of skill, independent judgment, and knack of handling crops and livestock which are possessed by the skilled farm workers who go into military service or industrial employment.

The agricultural colleges, vocational agricultural schools, and the cooperative extension services are willing and able to assist farmers with training farm labor recruits. And, fortunately, this need for training in the efficient use, care, and protection of machines and the safety of operators, especially with reference to tractors and other power and electrical equipment, is a matter already recognized widely as of prime importance by the manufacturers and dealers interested in the use and conservation of farm implements, as well as by the educational agencies.

The second factor, namely, that one-third of the farms produce 84 per cent of the marketed agricultural products, indicates the farms on which both labor and machinery scarcity will be felt most acutely on the "farm front". There will probably be material increases in production among the other two-thirds of the farms. In fact, the goals on many small farms can be increased more than average because of improved markets. But these smaller farms also have contributed heavily of their man power to war service and work, and their size or other limitations will still leave the burden of production on the 2 million operators of larger farms who must employ capable labor and who use the world's best agricultural equipment. Some of the most suit-

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able farm laborers for these farms can be obtained from the small farms, and this is being done in Wisconsin and Ohio. It is an efficiency move on the "food front" which merits the intelligent support of agricultural engineers.

The factors we have so far considered as determining the need for a nation-wide program on farm equipment conservation are the war for freedom, the role of food as a weapon, the utilization and recruitment of farm labor, and the productive capacities of the farms of our country. There are other factors having important bearing on the program, such as the transportation situation and the general control and balancing of the national war production effort. It will suffice, however, to recognize here that you are familiar with the governmental provisions for control of scarce materials, just a year ago discussed at the fall meeting of this society and at an extension conference following a program to aid farmers in coping successfully with the limitations on the production and sale of new farm machinery in 1942.

This fall four regional Extension Service conferences have been held covering all states, and dealing with the problems of farmers arising from War Production Board Limitation Order L-170 and related regulations which have been discussed elsewhere on this program. Briefly the following equipment conservation problems confront farmers:

THE SCARCITY OF NEW MACHINES IS BIG PROBLEM CONFRONTING FARMERS IN 1943

1 *Scarcity of New Machines.* Only one-fifth as much new farm machinery is to be manufactured in 1943 as the average sold in 1940 and 1941. These new machines will be limited principally to farms contributing to the increases in production goals. Materials for new machinery and parts are to be released to manufacturers in limited quarterly allotments. Rationing of selected items of farm equipment is in effect and the distribution of such farm equipment is under control. Rationing also calls for efficient use of all serviceable machinery, the salvaging of useful parts of unserviceable machines, and sharing by exchange or custom use, rental, or joint ownership when feasible. Prospects of scarcity have caused auction sales of used machines to bring prices in excess of ceiling prices for similar new machines. The manufacturing concentration ordered under L-170 also presents uncertainties in distribution of machines and the possibility of some retail outlets and services being closed. . . . Farm transportation facilities are drastically curtailed and must be conserved.

2 *Substitute Supply.* Reconditioning provides the most available substitution for new machines. Four-fifths of the machines which farmers will want to buy must be salvaged from machines they would prefer to discard. . . . Dependable reconditioning requires the services of good mechanics in well-equipped shops. Mechanics are scarce. Helpers are needed. Present shop wage limits induce mechanics to leave repair shops to enter war industry employment. . . . Farmers will need to dismantle and re-assemble machines in many cases to save the time of mechanics and lighten the transportation work. Homemade equipment using salvaged machine parts or requiring a minimum of critical materials is necessary to meet urgent needs.

3 *Repairs.* Replacement parts are limited to less in 1943 than were provided in 1942. Repair stocks held by dealers are also less this fall than last fall. . . . The concentration of manufacturing under L-170 may present uncertainties in distribution of replacement parts because of dealer business mortality. Replacement parts should be ordered NOW. The reasons are more urgent than last year. . . . All parts of all farm equipment should be carefully checked before ordering replacement parts, to avoid omissions. . . . Orders should be limited to parts needed for use in 1943, without "hoarding." . . . Customary replacement repairs should be made early, and by the farmers as usual.

4 *Preventive Maintenance.* Adjustment and lubrication are fundamental in reconditioning, repair, and care of farm machinery. The high standard of care required to offset the wartime scarcity of machinery is being emphasized as "preventive maintenance." Operating condition as good as new is the standard of preventive maintenance needed. . . . Lubrication in addition to its basic value in efficient operation is now a means of buying in oilcans more hours of farm machinery use. Bright surfaces and journals require protection from corrosion. . . . Painting of machines also has become more important, not only to afford protection, but also to promote the better care which operators give to machines new in appearance. . . . Shelter not only from sun, rain, and freezing weather, or damage by livestock or carelessness, but also from grit and from exposure of interior wearing surfaces to moisture condensation effects, is also imperative in preventive maintenance.

5 *Operation.* Many skillful tractor and power machinery operators have left the farms. Farm operators as well as the new farm laborers, some of them women and youths, will need instruction in operation, lubrication, adjustment, and care of machinery which is now almost irreplaceable. . . . Accidents and resulting loss of time, equipment, or crops should be avoided in large measure by training operators in skill and safety practices and by dependable preparation of equipment for the work it will be required to do. . . . Time-saving farming practices for labor and machinery must be given preference.

6 *Sharing Equipment.* Sharing the use of equipment is necessary to enable the available machines to serve the acreage involved in the wartime agricultural production goals. . . Exchange of use of machines and labor needs to be increased. . . . More custom work especially with tractors and with harvesting machines of all kinds is needed and rates charged for services need stabilization. Rental of machines needs promotion and the determination of fair rates on local bases. . . . Pooling of some essential equipment or cooperative ownership may need special attention in some circumstances. . . . Publicly owned tractors and machines adaptable to farm use should be made available for crop production.

A VIGOROUS MACHINERY CONSERVATION PROGRAM REQUIRED TO DEAL WITH MACHINE SCARCITY

The problems confronting farmers in dealing with the scarcity of farm machinery have been listed in the foregoing paragraphs. A vigorous machinery conservation program is required to deal with them, but following are the brighter aspects which will favorably influence it:

1 The inventory of machines on farms is probably greater than at any previous year.

2 There are more tractors on farms than at any previous time.

3 A very large percentage of the machines on farms has been in use less than three years.

4 A large percentage of farm machines have been kept in good condition in 1942.

5 Excellent repair shop and garage facilities are available throughout the country for servicing tractors and doing welding and other difficult repairs.

6 Most repair shops can still deal effectively with the repair jobs this winter if orders are placed promptly and the work is spread over the dormant *(Continued on page 16)*

Rental Rates for Farm Machinery

THE Committee on Farm Machinery Rental Schedule of the American Society of Agricultural Engineers was set up for the specific purpose of preparing a recommended rental schedule for farm machines. It began its task last September and this report presents the results of its efforts to date.

The primary purpose of a farm machinery rental schedule must be to facilitate the use of machines on more than one farm where this expanded use will increase the efficiency of agricultural production. The farmer has less labor available than ever before and also less opportunity to buy new or additional machines. Anything that can be done to promote the use of our most efficient, labor-saving types of machines to their full capacity will help alleviate the situation.

An ideal rental schedule should meet the following requirements:

1 Provide an incentive to the average farmer to rent out his machines when they have extra capacity which is needed in the neighborhood. To this end a reasonable margin of profit above the total cost of service at average usage must be provided.

2 Be concise, easily calculated, leave little room for disputes, and easily understood.

3 Compensate for differences in delivered prices in different sections of the country.

4 Compensate for differences in cost of use due to differences in amount of annual use in different areas.

5 Compensate for differences in rates of wear due to variations in operating conditions.

6 Be adapted to use by farm machinery dealers operating a rental business as well as by farmers.

The first step in setting up a schedule is to determine basic costs of service. The most important variable affecting cost of service is the amount of annual use. It is thought that the machines which are rented out will probably be used around 50 per cent more than previously, and costs have been calculated for an annual usage of approximately 150 per cent of the corn belt average, except for machines such as combines and corn pickers which have done considerable custom work in the past. These averages have been estimated from the various state bulletins available on the subject of machinery costs.

Depreciation has been calculated on a straight-line basis according to the estimated hours of life to be expected from each machine with the amount of repairs listed. It has been assumed that these rented machines will be worn out rather than become obsolete. As a matter of fact, it appears that obsolescence due to improved models will be practically halted during this emergency.

The estimated repairs necessary to keep the machine going for the above hours of life are given in per cent of the first cost. They have been charged at a uniform rate per hour over the life of the machine. Total repairs and hours of life have been estimated from a study of state bulletins.

The combined charge for interest, housing, taxes, and insurance comes to about 7 per cent of the average value of the machine. Since the average value of a machine throughout its life is approximately one-half the new cost, this combined charge has been covered by using 3½ per cent of the new cost in the calculations.

Table 1 shows for various machines the basic assumptions and the resulting total cost per hour per $100 of new cost. Table 2 shows a rental schedule based on the data of Table 1 except for certain machines used primarily outside of the corn belt. The basic charges after the first five hours are approximately 30 per cent above the computed cost estimates (except for the tractor which is 60 per cent), and it is felt that they will cover all normal costs and provide a reasonable margin of profit.

For purposes of simplicity and flexibility rates have been presented on an hourly basis. Conversions to the acre or daily basis can be made when desired.

Differences in delivered price and size of machine are taken care of by giving the rates per $100 of new cost. Conversions to standard charges based on average new costs for the various types of machines can be made when desired.

Compensation for differences in cost of service due to variations in annual use is difficult to secure. An approxi-

TABLE 1. BASIC ASSUMPTIONS AND COST ESTIMATES

Machine	Hours of life with repairs as shown	Total repair cost in per cent of new cost	Hours of use per year	Cost per hour of use per $100 new cost
Walking plow	3000	200	200	$.118
Riding plow	2500	80	200	.090
Tractor plow	2000	80	200	.108
Disk harrow, horse	2500	30	150	.075
Disk harrow, tractor	2000	30	150	.088
Spring-tooth harrow	2000	30	120	.094
Spike-tooth harrow	2500	30	120	.081
Roller	1500	10	100	.108
Soil pulverizer	2000	15	100	.093
Endgate seeder	800	15	60	.202
Grain drill	1200	20	80	.144
Corn planter	1200	30	80	.152
Rotary hoe	1500	20	100	.115
Cultivator, horse	3000	60	150	.077
Cultivator, tractor	2500	30	150	.075
Mower, horse	2000	50	120	.104
Mower, tractor	2000	50	100	.11
Sulky rake	1500	25	80	.127
Side-delivery rake	1200	25	80	.148
Hay loader	1800	20	80	.111
Stationary baler	4000	30	200	.05
Pickup baler	3000	40	200	.064
Grain binder	1000	30	100	.165
Thresher	2500	25	200	.068
Combine	2000	40	150	.0933
Corn binder	1000	20	80	.164
Silo filler	1200	30	100	.143
Corn picker	1500	30	150	.11
Husker-shredder	2500	25	150	.0733
Manure spreader	4000	15	300	.041
Wagon gears and box	15,000	50	400	.0188
Hay rack	8000	20	300	.027
Tractor	7500	35	500	.025

References:

1 Life, Service, and Cost of Service of Farm Machinery, Davidson, Iowa State College Bulletin 92, 1929.

2 A Farm Machinery Survey of Selected Districts in Pennsylvania, Josephson, Humphries & Church, Pennsylvania State College Bulletin 237, 1929.

3 The Use and Expense of Farm Implements, Byers and Inman, University of Kentucky Bulletin 345, 1933.

4 Power, Labor, and Machine Costs in Crop Production, Smith and Jones, University of Missouri Bulletin 197, 1933.

5 The Cost of Using Farm Machinery in Indiana, Butz and Lloyd, Purdue University Bulletin 437, 1939.

6 Costs of Farm Power and Equipment, Hertel and Williamson, Cornell University Bulletin 751, 1941.

7 Life, Service, and Cost of Service of Farm Machines on 400 Iowa Farms, Davidson and Henderson, Iowa State College Bulletin P37, 1942.

Report presented December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. A contribution of the A.S.A.E. Committee on Farm Machinery Rental Schedule — C. B. Richey (chairman), R. D. Barden, J. W. Martin, E. G. McKibben, H. E. Pinches, A. J. Schwantes, and R. I. Shawl.

mate compensation has been made by doubling the basic rate for the first five hours. This brings up the average rate as the length of rental period shortens and it is assumed that the rental periods will be shorter in low-use sections of the country. A higher average rate for short period rentals should be justifiable in any section.

These rates have been set up for average operating conditions, and severe operating conditions may justify higher rates. This will have to be adjusted locally.

Another problem is that of compensation for damage due to careless operation by the lessee. The most satisfactory solution would be to have the owner operate his machine on a custom basis. Where this is not feasible, a higher rate may be justified, and it must be understood that the lessee is responsible for damage beyond normal wear.

One problem which is particularly important from the standpoint of the dealer renting out machinery is that of a possession charge for the time when a machine is not actually in use. A farmer renting to a neighbor probably could not use a machine if the weather was such that his neighbor could not. With a dealer covering a large territory, a machine might be idle on one farm due to bad weather when it could be used on another farm. Also, it is desirable to make the machine available to the next user as quickly as possible. No recommendations are being made with respect to this problem because it is felt that the best solutions will result from experience in the field.

This schedule is derived primarily from corn belt data, but it is hoped that for most machines it will be applicable to the other sections of the United States. There are many machines used primarily in sections other than the corn belt which are not listed because reliable cost data could not be secured in time. Perhaps qualified individuals in these areas can arrive at rates consistent with those listed by comparisons with similar types of machines.

TABLE 2. RENTAL SCHEDULE FOR FARM MACHINES

Recommended by the Committee on Farm Machinery Rental Schedule of the American Society of Agricultural Engineers

Machine	Basic rental rate per hour per $100 of new cost		Machine	Basic rental rate per hour per $100 of new cost	
	First 5 hrs	After First 5 hrs		First 5 hr	After First 5 hr
Walking plow*	$.30	$.15	Sulky rake	$.34	$.17
Riding plow*	.24	.12	Side-delivery rake	.38	.19
Tractor plow*	.28	.14	Sweep rake	.36	.18
Lister plow*	.28	.14	Overshot stacker	.34	.17
Disk plow	.32	.16	Hay loader	.28	.14
Disk harrow, horse	.20	.10	Stationary baler*	.13	.065
Disk harrow, tractor	.22	.11	Pickup baler*	.17	.085
Field cultivator*	.24	.12	Peanut picker	.26	.13
Spring-tooth harrow	.24	.12	Grain binder*	.42	.21
Spike-tooth harrow	.22	.11	Thresher	.18	.09
Roller	.28	.14	Combine*	.24	.12
Soil pulverizer	.24	.12	Corn binder*	.42	.21
Stalk cutter*	.24	.12	Silage cutter*	.38	.19
Endgate seeder	.52	.26	Field silage harvester*	.40	.20
Grain drill	.38	.19	Silage blower	.34	.17
Corn planter	.40	.20	Corn picker	.28	.14
Rotary hoe	.30	.15	Husker-shredder*	.20	.10
Cultivator, horse*	.20	.10	Manure spreader	.11	.055
Cultivator, tractor*	.20	.10	Wagon gears and box	.048	.024
Mower, horse*	.26	.13	Hay rack	.07	.035
Mower, tractor*	.28	.14	Tractor*	.08	.04

*Expense of sharpening shares, shovels, sweeps, sickles, cutting knives, and cost of binder twine, baling wire, fuel, and lubricants to be borne by lessee.

This schedule covers *only* the use of the machine, not the time of an operator.

These rates may have to be increased to cover severe operating conditions.

This schedule is based on the assumption that the machine will be operated by the owner or his representative. If the lessee operates the machine, increases ranging up to 100 per cent in these rates may be justified to compensate the owner for relinquishing his control over the operation of the implement.

When the lessee operates the machine, he and the owner shall inspect it before and after the rental period and the lessee shall defray damage beyond normal wear.

The lessee shall defray the necessary transportation charges.

Farm Equipment Conservation Program

(Continued from page 14)

season before the most stringent man power demands of 1943 remove too many mechanics and the rush of farm work returns in the spring or dealer services decrease.

7 At the farm level of analysis, each farm is fairly well equipped for most operations in its schedule of production, and most farm managers can make certain that their machines are ready for the 1943 work.

8 Sharing labor and equipment and doing custom work is not only neighborly, but during the war it is also patriotic and should be profitable. The resourcefulness, ingenuity, and self-reliance of American farmers is reasserting itself with wartime vigor in the development of homemade farm equipment from power sweep rakes and portable grain elevators to hand-operated peanut pickers, and in the conversion of machines to new uses such as the spectacularly successful use of spray machines to extinguish farm fires.

9 Farm commodity prices and farm wages are expected to receive adjustment soon.

10 The President's executive order of December 6 delegating authority with respect to the nation's food program greatly strengthens that program.

FARMERS CAN RECEIVE AID FROM MANY SOURCES IN THE FARM EQUIPMENT CONSERVATION PROGRAM

As we examine this list of problems and encouraging aspects of the farm equipment conservation program, we should observe that farmers can receive aid on the farm front from many sources. Coordination of mutual cooperation by public agencies and private enterprise should be encouraged and facilitated at national, state, and county levels, and should be maintained as long as the needs of farmers are best served by concerted programs. People working for the same end can accomplish most by mutual understanding and effort.

The Secretary of Agriculture invoked this principle in the organization of the USDA War Boards through which the war work of the field agencies of the Department is coordinated at national, state, and county levels in programs of food production and the provision of the essential farm necessities for that end. Rationing of farm machinery is an unpleasant war task essential to fortifying the food front. The general maintenance of the inventory of farm equipment is also a responsibility inseparable from production. Hence, the war boards are also concerned with aiding the producers to maintain their equipment.

The Extension Service has membership in all USDA War Boards and undertakes the educational function in war tasks of the Department. Extension workers realize the urgency of educational effort and cooperation in the nationwide farm equipment conservation program and will do all they can to aid the farmers and all who help to supply farm needs.

Food is a weapon. Agricultural engineers associated in any connection with providing or maintaining the equipment for agricultural production can do much to preserve for the food front an effective service of supply. The farm equipment trade is performing that service. Many engineers in both public work and private enterprise can aid in conserving the usefulness of this service for farmers, and in promoting "preventive maintenance" and otherwise aiding farmers to use farm equipment most effectively. Let us continue our collaboration to assure by every effective means the conservation of farm equipment.

The Rationing of Farm Machinery

By L. L. Needler

THE rationing of farm machinery and equipment became necessary when it was finally determined that production must be restricted to a small fraction of the demand. Failure to have rationed would have resulted in a panic to procure new equipment just as we now have a panicky condition in the exchange of used equipment. The result of such conditions is distinctly not in the interest of the war effort.

The rationing of farm machinery to be produced in 1942 was seriously considered in the latter part of the year 1941, but when new production was established at a little over 80 per cent of 1940, it was thought that the Department of Agriculture could by working with the manufacturers and dealers probably accomplish a fairly satisfactory result. I wish to take this opportunity to thank manufacturers, distributors, dealers, and their respective trade associations for the help they extended. In many instances manufacturers and distributors established standards of use and encouraged their dealers to follow them.

Before the 1942 planting and harvesting seasons were ended many dealers were asking county war boards to make the selection of the farmers who should be allowed to purchase equipment. Rationing at the county level had thus been voluntarily begun and farmers had been relieved of the inconvenience attendant to formal rationing by a government agency. When it was finally settled by the Office of Civilian Supply and the Requirements Committee of the War Production Board that only about 20 per cent of the 1940 or 1941 production (the manufacturer being permitted to choose the year on which calculations would be based) could be produced in 1943 and that in numbers of implements the major portion would be produced by the smaller companies, there was no longer any question whether or not this scant supply would have to be rationed; it was a question of how it should be done and who should do it. With full knowledge that it was a nasty dishwashing job, the Secretary of Agriculture nevertheless believing that the Department was better equipped both in Washington and in the field, sought the authority to ration, and it was granted. He subsequently lodged the responsibility in his special war board assistant, and the Division of War Board Services, not because of any special talents but because of its close contact with state and county war boards, became the operating agency. We are a sort of accessory after the fact.

We are undertaking the job with a feeling that the best we can do will not be good enough, and we expect no public acclaim either now or hereafter.

The more we study the problem the more difficulties we seem to find. We have consulted all the major manufacturers and have received helpful suggestions from them but in the end they shrug their shoulders and say they are personally glad they do not have our responsibility. I shall mention only a few of our problems.

Unless the recent appointment of Secretary Wickard as Food Administrator alters the situation, the supply of equipment that will be available is much less than was purchased during the depths of the depression when man power was abundant and the price of farm machinery was high in relation to the value of farm commodities. Today the farmer not only has a much healthier pocketbook than he had in 1931, 1932, and 1933, but new equipment is needed to partially replace the loss of farm labor. The price of farm equipment has not increased as much as has the value of farm products. In pounds of pork and bushels of soybeans equipment is the cheapest it has been in years. New and improved equipment will save its own cost probably quicker than ever before. Too many strong and skilful farm workers and mechanics are gone from the farms, but, thanks to the men of your profession, the more modern equipment can be operated by less trustworthy hands and with less requirement of strength and endurance. These and other factors combine to make the work of the county farm equipment rationing committees anything but easy.

It is an undertaking much different and much more complex than rationing sugar or coffee or gasoline. With these commodities each customer presumably gets his fair share, but of those who will apply for farm equipment probably not one out of five, maybe not one out of ten, will be accommodated. For the most part, sugar is sugar and coffee is coffee and gas is gas, but there are over 70 different types of farm equipment to be rationed. These 70 different types will be produced by some 500 different manufacturers, and then there are several and in some instances numerous models of each different type and each has its peculiarities and many of them their particular adaptability.

The so-called *concentration* plan distorts former distribution patterns. Since the small manufacturers will produce a much larger percentage of the total than formerly, their trade area must be expanded if we are not to leave certain areas entirely without various types of equipment. Some equipment is designed for special areas and special purposes so, for example, we must guard against the shipment of a plow designed for the muck lands of Michigan to the stony area of New England.

New sales outlets must be used by those who are distributing into new areas where neither the dealer nor the farmer understand how best to make adjustments. Neither can dealers be expected to stock repair parts in new areas of distribution, and furthermore the volume of repair parts to be produced will not permit it. We are disturbed about the prospective dealer mortality. When and if the dealer closes his shop and is no longer available for field adjustments, the farmer is subjected to unusual inconvenience and loss of time in the use of his equipment.

Although many doubt that a sufficient allocation has been made of material for repair parts, in the opinion of the Farm Machinery Branch of WPB, and I might say in the opinion of several manufacturers with whom we have discussed the matter, the supply will be adequate except in new trade areas as before mentioned. If a shortage should develop, we trust it will be sufficiently in advance of the seasonal use to make it possible to secure and have processed additional material. This is a possibility, not a probability. If a stitch in time ever saved nine, farmers should immediately see to it that adequate repairs are made.

A much longer tale of woe could be recited and I have given this much time to the dark side of the picture only to impress you with the fact, if you are not already so, that an endless lot of problems lie ahead. Your help is solicited

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An address delivered December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. Author: Director, Division of War Board Services, U. S. Department of Agriculture.

that they may be the better solved, and in the end we shall give careful ear to those who have never made mistakes.

You, as engineers, are probably more interested in what has been done and what plans have been laid to cope with the situation.

Long before Limitation Order L-170 was issued the Department and the Farm Machinery Branch and Office of Civilian Supply of WPB delved into the task of determining in what volume and in what proportion of the total volume should allocations of materials be made for the various types of equipment. The WPB gave special attention to simplification in its various phases. Elimination of this or that scarce material was made. The requirements were boiled down to the minimum, and maybe below. Consideration was given to that equipment that would apply best to the production of the war crops. Essentially it was how to use best that which would be made available, knowing all the time that every possible saving should be made that we might have more with which to confront the enemy, that the boys who are fighting the most terrible conflict of all time might not want for the tools of war. The result of this long and tedious work is expressed in order L-170.

THE BIG TASK IS TO MAKE THE FARM MACHINERY PRODUCED DO THE GREATEST POSSIBLE GOOD

We are now faced with the task of making that which is to be produced, do the greatest possible good. To this end state quotas on nearly all the rationed items have been established. These quotas were arrived at after taking into account such factors as the historical purchase and use of equipment; to what extent the planting, cultivating, and harvesting of farm crops has been mechanized in the various states; the food goals with special emphasis on the war crops; climatic conditions; recent trends of use; availability of farm labor, and other factors.

Feeling that the facilities available to the state war boards, together with their more intimate knowledge of conditions within their respective states, best fitted them for the work, they have been asked to break their state quotas down into county quotas. This of course creates a very exacting pattern, for if a county has a quota of twelve tractors and issues purchase certificates to cover each of them, then twelve tractors must be delivered to that county, or there will be trouble on the home front.

To meet this requirement the Office of Agricultural War Relations is to furnish our office with a plan of distribution. This plan, for each type of equipment to be rationed by the county committees, and on a few other types as well, will be developed after having secured from the manufacturers their own proposed plan of distribution. These collective plans for each type will be matched against the state quotas, and necessary adjustments made in the manufacturers' plans to fit the quotas. We expect to make the first try with milking machines. The experience thereby gained may be found useful in distributing other types of equipment that yield themselves less readily to such a plan. The year-round use equipment will be distributed and rationed first. By the time the new production comes off the assembly line in volume we hope to have the process streamlined, to a considerable extent probably by the trial and error method, for a job like this has never been done before and there are no patterns which can be copied to any considerable extent. If there were, like the Japs, we would copy. It is the distribution not the rationing that gives rise to the most concern. If the same manufacturers that have always produced the equipment were producing this year although at a much lower rate, we would have a national distribution pattern to work with, but the concentration plan upsets the applecart.

As soon as a distribution pattern has been developed for a given type of implement, that implement will be released so far as restrictions now prevailing on manufacturers, distributors, and mail order houses are concerned, and as the equipment moves into dealers' hands may be sold to anyone holding a purchase certificate applicable for this equipment. We are seriously considering requiring the manufacturer to tag every piece of equipment shipped. The tag would indicate the county where the equipment is to be rationed. The dealer would be obligated, therefore, to deliver to a farmer holding purchase certificates issued by the county committee of the county indicated on the tag.

Under any other method which we can think of, there would be a great deal of confusion by farmers presenting purchase certificates to dealers in adjoining counties or without the trade area of the dealer. This would result in floating purchase certificates within the dealer's trade area, and in order for the purchase certificate to be satisfied the farmer would have to find another dealer who had the equipment. The total result would be, it seems, endless confusion. To avoid this we think we shall ask manufacturers to tag each piece of equipment.

Fencing and milk cans are rationed by county farm rationing committees and by state war boards. The concentration provision of Order L-170 does not apply to these two items and the distribution is therefore not disturbed to any great extent. It would be desirable and would greatly simplify distribution and rationing if the same situation prevailed in respect to farm machinery and equipment.

RATIONING HEADS DISTURBED ABOUT PROSPECTIVE MORTALITY AMONG EQUIPMENT DEALERS

It is putting it mildly to say that we are disturbed about the prospective mortality among farm equipment dealers. When a dealer, and particularly a service dealer, is forced out of business, the repair and maintenance of the farm equipment in that dealer's trade area would be severely handicapped. In such instances, the farmer will receive less prompt service, will be occasioned a loss of time, and an increase in travel and communication, the total of which will amount to many thousands of hours of lost time. Some dealers intend to make application to the farm machinery rationing committee for equipment which they will use in custom work. It has also been suggested that the dealer be the headquarters of information for farmers who have custom work they want done and for custom operators seeking custom work. These two factors would result in helping to keep the dealer's doors open. We trust that farm machinery rationing committees will recognize the importance of granting purchase certificates to custom operators as they can perhaps accomplish more work with the equipment than many farmers who propose to individually use the equipment, even though it is provided in the regulations that the successful applicant must lend or make custom use of the equipment procured. The custom operators being dependent to a greater extent upon the success of this work as a custom operator and being in a somewhat better position to keep his equipment in good order and to work longer hours in the field, gives a ray of hope that we may take the amount of equipment provided for and spread it out for the use of many farmers.

We are grateful to the American Society of Agricultural Engineers for many ideas that have been furnished us. Oftentimes these thoughts have found expression in the rationing program which has been outlined. We crave your further cooperation.

Production Rating of Farmers Under Wartime Conditions

By Frank J. Zink
MEMBER A.S.A.E.

PERHAPS it would be more to the point if the first two words of this title were "production efficiency". Also, perhaps, the time of use of such a rating is irrelevant to the topic. Whether in wartime or in peacetime, production efficiency as used by the agricultural engineer should have no place for a different set of values used in the formula for calculation.

I have, at this time, no settled opinion as to which of these terms is most suitable. "Production rating", however, seems advisable for our needs for the duration of the war. After the conclusion of the war and with a greater general acceptance and application of the term, "production efficiency" of a farm undoubtedly would be preferable.

We have for many years, both professionally and as laymen, used glibly the term "farm efficiency". Literature on agricultural production contains many references to the term. As such it has no definite meaning on a numerical basis, such as is commonly found in engineering usage. The term has been so loosely applied that a "hard-working farmer" or a "careful and meticulous farmer" are referred to as efficient.

We have been prone to use efficiency as a relation of value of output and cost of input or from the viewpoint of profit obtained. From an engineering viewpoint for comparing farm equipment and labor relationships, the monetary value of output per worker is an unstable and deceptive measure. Profit is of utmost importance but under wartime conditions efficient production of food, or, for instance, of shells, is more important to the winning of the war than is the profit angle. Furthermore, the value of output per worker cannot readily be used in combination with intervals of time.

In a war period the need of a means for the calculation of production efficiency of a farm assumes greater importance than normally. Shortages of various kinds focus attention on the greater need for the development of such a yardstick for the measurement of the ability of farms to produce. This measurement is desired for the purpose of comparison of units of production and the selection of best performances.

By way of a brief review of material having a bearing on this subject, farm managements specialists at some agricultural colleges have to some extent used the term "work units" which I understand were derived from cost account records. These work units have been offered to farmers so that they might check up on their own production efficiency. Last March the extension economist in New Hampshire, A. F. Abell, prepared a press release for the use of New Hampshire farmers, entitled "Yardstick for Farm and Labor Efficiency", in which one work unit was equal to a 10-hr day and a full-time work year would be from 275 to 325 work units.

This New Hampshire score card offers the farmer a means of self-checking the crops and livestock produced, multiplying the numbers of each by a conversion factor to determine the total units of output in relation to the work units of input. When applied the operator calculates the total work units required for his operation, which merely shows whether "a farm really needs more workers than it now has on the job"; also, it will show if "a farm has more man power than it needs". No other relationship is illustrated by this score card.

With attention focused on wartime production, A. P. Yerkes, in a paper before the Southwest Section of the American Society of Agricultural Engineers in April 1942 (see AGRICULTURAL ENGINEERING for April 1942), called attention to the need of a suitable "norm" for comparing one farm producer with another; however, he did not indicate the method of arriving at this "norm".

Also, as a wartime measure, we know that in Great Britain farms are classified into three groups, (a) well-farmed, (b) moderately farmed, and (c) badly farmed. Obviously to arrive at some classification of this kind, it was necessary to use some type of yardstick. So far I have not been able to find a suitable reference to this British plan so as to determine values used in their classification.

The consideration of such a measure as production rating is desirable for two specific reasons: (1) To facilitate the selection of man power for the operation of farms so as to maintain in farming the highest level producers of food, and (2) to facilitate, under conditions of limited supplies of production including farm equipment, the selection of who should obtain an item or combination of items of supplies so as to attain maximum production for the war effort.

I understand there are at least fifty factors which have been individually applied with reasonable success in the form of a composite rating for the purpose of gauging the ability of an applicant for a farm loan to repay the principal and maintain interest payments along with adequate security of risk. In such an appraisal, monetary values are necessary.

As engineers we should develop numerical values of farm efficiency in terms of time input and product output. We then can compare organization of work, organization of equipment, equipment performance under the conditions involved, and the overall operations at different time periods.

I presume that we have several dozen factors of farm production each of which can be represented numerically and without reference to monetary values. However, it is desirable to have a composite efficiency of production on a numerical basis. For our immediate needs for selective purposes, detailed attention need not be given to individual factors of production.

Land, labor, and machinery are the primary factors of food production. To provide a composite value, no doubt time input and food or food-product output are the easiest to relate. To have comparable terms the output can be related or converted to time units on a comparative average basis. Thus by a ratio of output to input in units of time,

Paper presented December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. A contribution of the Power and Machinery Division. Author: Director, research department, Farm Equipment Institute.

FARM PRODUCTION RATING FORM

(A suggested form for use by selection boards as it applies to individual farmers for one-year periods)

SECTION I — *Production*

CROP PRODUCTION

Products	Acres	Yield per Acre	Units	Production in Units	Factor	Weighted Production Units Col. 5 x Col. 6
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corn (for all purposes)			100 bu		90	
Wheat			100 bu		41	
Oats			100 bu		27	
Barley			100 bu		30	
Rye			100 bu		64	
Rice			100 bu		43	
Mixed grains			100 bu		30	
Peanuts			100 bu		18	
Soybeans (harvested for beans)			100 bu.		45	
Cowpeas			Acre		9	
Velvet beans or forage beans			Acre		9	
Beans (edible)			100 bu		70	
Hay (all including sorghum for forage)			Tons		5	
Tobacco			100 lb		15	
Cotton			Bale		220	
Sugar cane			Acre		75	
Sugar beets			Ton		12	
Flax			100 bu		60	
Potatoes (Irish)			100 bu		64	
Potatoes (sweet)			100 bu		94	
Vegetables (all)			Acres		125	

Total Crop Production Units .....

LIVESTOCK PRODUCTION

Product	Units Quantity		Units	Production in Units	Factor	Weighted Production Units Col. 5 x Col. 6
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Beef cattle including calves			100 lb		3	
Milk cows (dry)			100 lb		3	
Butterfat			100 lb		120	
Milk			1000 lb		33	
Hogs			100 lb		4.2	
Sheep			100 lb		4	
Chickens			Each		2	
Eggs			10 doz		2.5	
Turkeys			Each		8.0	

Total Animal Production Units .....
Total Crop Production Units .....
Grand Total Production Units .....

SECTION II — *Work Required*

TIME UNITS

	Months of Work	Factor	Time Units, Col. 1 x Col. 2
	(1)	(2)	(3)
Men—15 to 60 years old		1	
Men—Over 60 years		0.5	
Women—15 years and older		0.5	
Children—14 years and younger		0.5	

TOTAL TIME UNITS ——

SECTION III — *Production Rating*

The production rating is determined by dividing the grand total of weighted production units from Section I above by the total time units from Section II.

Production Rating .....

Name of Applicant .....

an efficiency value may be established. This efficiency value should be satisfactory to compare performances.

About a year ago, I made some calculations of the 1942 food goals in terms of time requirements. At that time I used units of time on a national average for products produced. In a paper presented at the A.S.A.E. annual meeting (See AGRICULTURAL ENGINEERING for October 1942), I pointed out that each person working in agriculture supplies the food for 13 people. In 1943 the rate of lend-lease buying is going to be 20 to 25 per cent of the total food production. Thus each person counted as working in agriculture will produce the food for approximately 16 people during 1943. So if any person is not working up to average, he is below the output of the food for the 16 people.

In conjunction with the work of the Committee on Wartime Distribution of Farm Machines of the American Society of Agricultural Engineers, I pointed out that the time units required for each kind of crop or product production could be related to the time units of input of any farm in relation to the national average of time requirement for each item of production. The nub of the plan,* which I recommended and which was adopted by the A.S.A.E. Committee, is shown by the accompanying "Farm Production Rating Form", from which it will be seen that a production rating or the production efficiency of a farm equals the grand total of production units converted to time units divided by the total time units.

On December 4, 1942, the U.S. Department of Agriculture released a series of forms, entitled "Farm Plan Work Sheet for Maximum War Production for 1943", which will be used by state and county war boards on each farm. In these forms the term "war units" is used. The value of a war unit is not indicated, but in one of the forms it is stated that "sixteen war units are assumed to be the minimum number per worker for selective service classification." It is my opinion that one war unit is about equal to the food requirement for one person for one year. It will be noted that I have pointed out in this paper that each person working in agriculture must in 1943 supply food for sixteen persons.

The conversion factor as used in the USDA work sheets for farms obviously bears a relationship to the time required for the production of each kind of crop and each kind of product production. Again it is my opinion that the decimal used in this conversion factor is approximately one-hundredth part of the time required on the basis of the national average. It should be noted that this USDA

*EDITOR'S NOTE: The plan for determining the production rating of individual farms, recommended by the A.S.A.E. Committee on Wartime Allocation of Farm Machines, was submitted to Washington officials on August 17, 1942. The plan is discussed in detail in an article by A. W. Turner, chairman of the Committee, appearing elsewhere in this issue.

INSTRUCTIONS FOR USE OF PRODUCTION RATING FORM

1 Data on production from a farmer's application is transferred to the form as follows:

(a) Acres of production of individual crops are entered in columns 1 and 2.

(b) Yield per acre is entered in column 3, using the same units as indicated by column 4.

(c) In column 5 enter total production in number of units as shown in column 4. Example: 20 acres of corn yielding 40 bu per acre produces 8 units of 100 bushels.

(d) Column 7 is calculated by multiplying columns 5 and 6, and is added to give total weighted production units.

2 Data from the farmer's information schedule is entered in Section II of the form under "Months of Work" by each class of persons working. "Timing units" shown in column 3, are calculated by multiplying columns 1 and 2.

3 The production rating, or efficiency factor, is calculated as indicated in Section III. (In comparing two or more producers, higher or highest efficiency factor denotes superior production ability.)

plan does not take yield per acre or production units into account. In working out the production rating which I have proposed in this paper, actual production was considered as essential. As an example, the machinery wear-out and time requirement up to time of harvest on a corn yield of 7 bu per acre would be ten times as great as it would be on a 70-bu yield under conditions of similar use of equipment. It would also result in nearly ten times the wear on a corn picker. Time requirement for harvest would be obviously less, however, on the low yield.

Quantity, therefore, is essential to any efficiency rating for facilitating selections as a wartime expedient.

* * * * *

Since the foregoing paper was prepared, my attention has been called to the accompanying article, entitled "Crop Units to Guide Farm Deferment," reprinted from the December 15, 1942 issue of "Victory." In this the conversion factors are varied but slightly from the USDA "Farm Plan Work Sheet for Maximum War Production for 1943". Other than the use of decimals in the Selective Service and USDA Farm Work Sheets, along with the quantity considerations, the proposed production rating is significantly similar.

The Selective Services and Farm Work Sheets, however, establish a national average by the selection of 16 war units. Apparently from their inception it is planned to use this median figure.

Crop Units to Guide Farm Deferment

A NEW Selective Service release to local boards, defining essential farm products and establishing "factors" to determine what workers are essential, and hence to be classified in 2-C and 3-C, the new agricultural classifications, was made public December 5.

Production of 16 "war units" will be required under the definitions set up by the Department of Agriculture, and approved by the War Manpower Commission, for classification of a farm worker as essential. The production that counts is to be that attributable to the worker's own effort, whether on one or several farms. According to the order the 16-unit standard is to be only a guide for local boards, which may decide to defer a man because they think he could increase his production to that level in six months, or may decide to adopt higher standards because of local conditions. The order states: "A war unit is a measure of production of essential farms products. In the accompanying table, entitled "Table of Products and Conversion Factors", essential farm products are given a relative value in terms of war units. The following, for example, are each equivalent to one war unit; 1 milk cow, 20 feedlot cattle, 1 acre in apples, 5 acres in dry beans, 15 acres in wheat, 1 acre in carrots; etc."

An example of a farm worker's "score":

	Animal units or acres x conversion factor	War unit
45 acres corn	45 x 0.20	9.00
30 acres pasture	.....	.....
25 acres oats	25 x .07	1.75
30 acres wheat	30 x .07	2.10
15 acres timber	.....	.....
5 milk cows	5 x 1.00	5.00
12 hogs	12 x .05	.60
100 hens	1 x 1.30	1.30
Total war units		19.75

The "conversion factor" by which calculations may be made of the war units credited to a given farm worker, is "the percentage that a given product, whether it be a single animal or a single acre of special type production, bears to a war unit, for example:

"1 acre of wheat is 0.07 of a war unit.
"1 acre of cabbage is 1.00 of a war unit.
"1 hog is 0.05 of a war unit; etc.

"The number of acres given to a certain type of production or the number of animals of a specified type multiplied by the conversion factor results in the war unit value, for example:

"3 hogs multiplied by the conversion factor of 0.05 results in 0.15 war units.

"19 acres of Irish potatoes multiplied by the conversion factor of 0.50 is equivalent to 9.50 war units; etc."

TABLE OF PRODUCTS AND CONVERSION FACTORS

	Number of animals or acres to equal 1 war unit	Conversion factor
1. Livestock and livestock products:		
(a) Beef cattle:		
(1) Farm herds	12	0.08
(2) Feedlot	20	.05
(3) Range	15	.07
(4) Stocker (brought and run on grass)	75	.01
(b) Chickens:		
(1) Broilers	600	.17*
(2) Egg production	75	1.30*
(3) Flock replacement	300	.33*
(c) Hogs	20	.05
(d) Milk and its products	1	1.00
(e) Sheep and wool:		
(1) Farm flocks	30	.03
(2) Lambs in feedlot	160	.62*
(3) Range	45	.02
(f) Turkeys	40	2.50*
2. Fiber and oil crops and potatoes:		
(a) American-Egyptian cotton	2.5	.40
(b) Castor beans	3.0	.35
(c) Flaxseed and soybeans	12.0	.08
(d) Hemp	5.0	.20
(e) Peanuts, Irish potatoes, and sweet potatoes	2.0	.50
3. Field crops:		
(a) Barley, wheat, grain sorghums, oats, rye, dry field peas, cover crop seeds, hay and hay crop seeds	15.0	.07
(b) Corn, dry edible beans, rice, broomcorn, green peas, and sweet corn	5.0	.20
4. Fruits, tree	1.0	1.00
5. Medicinal and insecticide plants: Aconite, belladona, digitalis, henbane, and prethrum	0.4	2.50
6. Small fruits and berries: Blackberries, cranberries, dewberries, raspberries, blueberries, (tame), strawberries, currants, gooseberries, and quinces	0.7	1.50
7. Truck and canning crops: Broccoli, Brussels sprouts, collards, endive, kale, tomatoes, carrots, chard, escarole, mustard greens, spinach, turnip greens, onions, snap beans, green leafy lettuce, lima beans, green peppers, turnips, asparagus (from present plantings), cauliflower, cabbage (other than Wakefield)	1.0	1.00
8. Other foods and special crops:		
(a) Cotton, Upland, 1-inch and over	2.0	.50
(b) Nuts (from present plantings)	5.0	.20
(c) Sugar beets	2.0	.50
(d) Sugar cane	1.0	1.00

Non-essential farm products for which no war credits are given, were listed as follows:

1. Special crops:
   - (a) Cantaloupes
   - (b) Cotton, Upland, under 1 inch
   - (c) Hops
   - (d) Popcorn
   - (e) Watermelons
2. Vegetables:
   - (a) Artichokes, celery (bleached) eggplant, and lettuce (Iceberg)
   - (b) Kohlrabi, cucumbers, horseradish, okra, radishes, and rhubarb
   - (c) Garlic and leeks
   - (d) Pimentoes, squash, and pumpkins
3. Other crops not listed

*Per 100 head.

Wartime Allocation of Farm Machines

By Arthur W. Turner
FELLOW A.S.A.E.

THIS PAPER is primarily a report of the committee appointed July 1, 1942, at the annual meeting of the American Society of Agricultural Engineers to devise and recommend a plan for wartime allocation or rationing of critical farm machines. No attempt will be made in this paper to discuss the present USDA rationing program effective as of November 28, but rather simply to explain the proposed plan formulated by the committee and submitted to Washington officials on August 17.

The Committee, conscious of the seriousness of the farm machinery situation in the face of demands of the food-for-freedom program foresaw a decided shortage of farm equipment, but not as serious as it now promises to be under Limitation Order L-170. This shortage of equipment plus the farm man power situation presents the nation and the world with a critical food problem. Food is war goods or munitions, and from what history has taught as to the importance of food in wartime, serious results threaten if food production is jeopardized.

It was with this critical situation in mind that the committee met in Chicago early in July to formulate and propose a plan whereby the limited amount of new farm equipment might be allocated where it would contribute most toward victory in the world struggle. The following objectives for such a plan were set up:

1 All available new equipment to be put to use with the exception of a small emergency reserve or pool

2 All equipment to be distributed where it would accomplish the most for the food-for-freedom program

3 The plan to be logical, feasible, and simple, one that could be administered with minimum cost to government, industry, and business, and provide maximum convenience to both those desiring and those allocating equipment

4 Supervised allocation or rationing to be held to a minimum and to cover only machines of a major qualification. (This was not intended to cover machine parts which should be available to meet all requirements.)

Special attention is called to the third of these objectives. It was thought a plan should be devised that would cause as little disruption in civilian activity as possible, certainly a plan that would not require an expensive organization for its administration. Man power is at such a premium it was believed a plan could be worked out that would call for few, if any, additional paid personnel. In fact, the Committee felt that civilians are willing to sacrifice more of their time in the present war effort and to help release people for war industry and the armed forces. Furthermore, it was believed that any additional cost in the distribution or allocation of farm equipment will eventually come back to the taxpayer, in which group the farmer holds a large membership.

Paper presented December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. A contribution of the A.S.A.E. Committee on Wartime Allocation of Farm Machines—A. W. Turner (chairman), E. G. McKibben, A. J. Schwantes, Martin Ronning, and Wm. E. Meek. (Advisory members; E. W. Lehmann, R. B. Lourie, F. J. Zink).

ACKNOWLEDGMENT. The plan presented in this paper is the result of the joint endeavor of the above-named committee members. The Committee acknowledges the fine assistance given by staff members of a number of agricultural engineering and rural economics and farm management departments of land-grant colleges and by representatives of the farm equipment industry and retail dealer organizations.

With reference to the second objective, the Committee believed that equipment should be distributed on the basis of production ability, and that a method should be devised for determining that ability.

In the plan now in use for rationing automobile tires, the rationing boards give preference to certain classes of users, including physicians, ministers, farmers, etc. So long as there are enough tires to meet the needs of these special groups, the local boards do not have a serious problem. However, when the time comes that there are not enough tires for all the physicians, say, then the board will have to establish some method to determine those who should receive the tires.

The A.S.A.E. Committee on Wartime Allocation of Farm Machines, confronted with the situation of a serious shortage of all farm equipment, first of all undertook to formulate a method or "yardstick" that would enable the local boards to distinguish between farmers on an unbiased basis. Such a yardstick was made the major part of our program.

The initial step in developing this yardstick was to construct an appropriate background, the main feature of which was the recognition of the importance of farming as a war industry. First of all, it is not fair to compare machinery needed to produce food with the automobile, home appliances, etc. Food is definitely war munitions, and it can be produced by the farmer only with the aid of labor, power, and equipment. The farmer's war production schedule has already been subjected to heavy demands: (1) His output quotas have been raised, (2) special new crops are required, (3) he is experiencing a serious labor shortage, and (4) his supply of operating power and equipment is greatly reduced. It does not seem wise, therefore, to subject him to additional handicaps and jeopardize further the food supply of the armed forces, our allies, war workers, and civilians.

In view of the critical farm situation, the Committee recommends that farmer, dealer, and manufacturer relationships be kept as nearly normal as possible. The farmer relies on his dealer for equipment and service. The dealer is familiar with the many soil, crop, climatic, and other factors affecting farm production. He knows his customers' equipment requirements; in fact, his organization through years of training and experience, both with supplying manufacturers and farmer customers, is a vital and irreplaceable link in the food supply chain. Also, the manufacturer's lifelong experience is needed now more than ever to provide and distribute practical and dependable equipment to the dealers. Their experienced staffs, working in cooperation with dealers and farmers, place them in the most effective position to do the job.

Assuming that the foregoing relationships will be maintained, the Committee recommends that its proposed method of allocating farm operating equipment from the manufacturer to the farmer user be in accord with the following general procedure:

1 All farm operating equipment to be apportioned by the manufacturers to states and territories through their branches and distributors similar to the procedure followed in 1942. Realizing that crop conditions and equipment replacements follow a fairly definite pattern, the amount of available equipment in 1942 was allocated on the basis of

a uniform percentage of the preceding two years' deliveries. Consideration was given, where advisable, to the dealer's equipment inventory (goods on hand) as well as to abnormal weather conditions. Other variations were made to take care of actual increased production of specialized or preferred products—dairy, soybeans, peanuts, etc.

2 All equipment, following allocation to branches and distributors, to be reallocated by them to their dealers.

3 Final allocation of selected machines to farmers or individual users to be by a county or corresponding local area rationing board consisting of three persons, all serving on a voluntary basis without compensation.

Two methods are suggested by which local rationing boards may allocate farm equipment to users—the progressive and the periodic. Under the progressive system each individual request for equipment would be acted upon as it is received, but this has these objections: (1) It may distribute the equipment to the first requisitioners and thereby prevent more deserving users from getting it later on; and (2) the rationing board might withhold equipment from service anticipating later calls for it.

The periodic method would eliminate both of these objections, for by it the rationing board would set definite dates at which all requests for new equipment would be on file. For seasonal farm machines there would naturally be but one period a year, the deadline being several weeks before the equipment would be needed in the field. For tractors and other year-round machines there would be more than one distribution period annually. The Committee recommends that these periods not exceed six per year.

Under the periodic method the rationing board would consider and evaluate all requests for each particular type of machine. It would then distribute the available supply to the farmers the board believes will make the largest contribution to the nation's and the world's food supply.

A POOL OF 3 PER CENT OF AVAILABLE TRACTORS IS RECOMMENDED AS A RESERVE SUPPLY

It also seems desirable that a small pool of approximately 3 per cent of the available supply of tractors be kept in reserve in each state. This would provide tractors to take care of unexpected emergencies, such as accidents, fires, and other disasters. With such a reserve pool many state requirements, in emergency cases, could be met any time prior to the next allocation period. In case of a major disaster covering a section of a state, it should be possible to draw on other state pools to help relieve the situation. Also, a major crop disaster in one section would release equipment for use in other areas.

The A.S.A.E. Committee in formulating its proposed plan, divided users of farm equipment into two groups: (1) Farmers who use equipment almost entirely on their own farms, and (2) custom farmers, men who derive most of their income from farm equipment used on farms other than their own. The Committee also devised a separate specimen application form for each group of farmers, which it proposed be used in applying to rationing boards for needed equipment.

A number of organizations and groups have advocated the pooling of farm equipment for community use. It should be pointed out, however, that farmers have long been doing this through the practice known as exchanging or trading work. Although there will be greater community use of equipment, this factor, however, can be stressed too much. The weather is so unpredictable, especially on a long-range basis, that it is advisable to allow a pretty good safety factor to compensate for the irregularities in weather and crop conditions. There are many field operations that must be completed within narrow limits of time if the crop is to be saved, let alone produce maximum yield. So statistics or acreage capacities of farm machines cannot be relied on too much without proper consideration for weather and crop conditions.

The Committee recommends that special consideration be given the custom farmer during the present emergency, because of the advisability of placing equipment in the hands of people or organizations qualified to get the most use out of it. In fact, the application form prepared by the Committee for this group has several questions to help determine the applicant's responsibility as a custom farmer.

In this connection, a report should be required of the custom farmer at the close of his year's work, in which the number of farmers and acres worked on various field operations are listed. This will tend to eliminate duplicate requests for the same equipment in the same territory.

The Committee believes that rationing boards should allocate available new equipment to those farmers who will accomplish the most for the food-for-freedom program. The following factors should be taken into consideration in making the allocations: (1) Acreage, both total farmed and that in preferred crops, (2) condition of the farmer's power and equipment, (3) the farmer's labor situation, and (4) the farmers' production rating.

SUGGESTED FORM FOR APPLICATION FOR MACHINES PROVIDES FOR COMPLETE PRODUCTION PICTURE

On the suggested farmer's application form prepared by the Committee, space is provided for the total acreage after which there are seven spaces in which applicant can state his reasons for needing the machines; these are (1) new crops, (3) increased acreage, (3) machine worn out beyond economical repair, (4) replacement of work animals, (5) labor shortage, (6) accident, fire or other disaster, and (7) starting farming. The application form also provides for a machinery inventory of the farm. Another section requests information on the further use possibility of any equipment that will be "traded in", if the purchase of the new machine is granted. The applicant is to give his crop production picture in crops and acreage for 1941, 1942, and his contemplated program for 1943. A similar picture of his livestock production is requested. Two other questions on the form ask whether the requested machine will be used on other farms and also whether any custom equipment will be used on his farm. There is space also for giving the amount of labor used in 1942, and the 1943 labor prospects.

When completed the application form would be submitted to the county rationing board prior to the deadline date for filing requests for that particular machine. Incidentally, the Committee recommends that all applications for equipment be kept on file at the county board headquarters where they can be viewed as an indication of quantities and types of machines that will be required for the 1944 farm year.

The next step in the proposed A.S.A.E. plan provides that the rationing board shall transfer the information from the farmer's application form to the Farm Production Rating Form recommended by the Committee on Wartime Allocation of Farm Machines. This form is the "yardstick" for rating farmers on their production ability or efficiency, as it makes it possible to reduce all products to one common denominator to obtain a farm's total production, including livestock as well as grains and other field crops. The Com-

mittee considered farming as divided into two classifications—crop production and livestock production—and the production rating form is arranged to show them separately.

Referring to the accompanying farm production rating form, the various products are listed in column 1, acres or other units of measurement in column 2, yields per acre or unit in column 3, production units used by agricultural economists in measuring man-hour requirements in column 4, production of products in units in column 5, conversion factors (obtained from a survey of available source material) for reducing each product to a common denominator in column 6, and the weighted production units of each product in column 7.

To illustrate the use of the production rating form, the 1941 figures of an Illinois farm are filled in on the form. Taking the first entry, it will be noted that the farm produced 163 acres of corn which yielded 62 bu per acre. Production in units (column 5) is obtained by multiplying 163 (column 1) by 62 (column 2) and dividing by 100 (column 3), which in this case equals 100. The figure 100 is then multiplied by the conversion factor, 90 (column 6), which equals 9,000 (column 7), the value for weighted production units. The values used by the Committee are average or better than average practice; however, actual values whether in the high or low range are immaterial in comparing one producer with another in a single county.

In the example taken, it will be noted that there is a total of 10,738 weighted crop production units and 1,082 weighted livestock production units, or a grand total of 11,820 units.

Section II of the form provides for indicating work required to produce the units recorded in Section I. In the example taken, one man, supposedly the owner, and two hired men (or two sons) worked the entire year, or a total of 36 man-months. Also one boy worked three months, his time being figured at one-half of a man, or 1½ man-months. The total work required then is 37.5 man-months for the year.

In Section III of the form, the grand total of weighted production units from Section I is divided by the total time units from Section II. The result (11820/37.5=315) is the "production rating" of this particular farmer.

To illustrate further the application of the production rating "yardstick", let us say that there are 35 requests in one county for combines and that all seem reasonable. But suppose that, due to government allocations, the total number of combines available to all dealers in this county is only 5. The first step then is to determine the production ratings of all 35 applicants. With all other factors being equal, the 5 farmers with the highest production rating would be the logical ones to receive the equipment.

For the development of this production rating "yardstick", through the efforts of its Committee on the Wartime Allocation of Farm Machines, it is believed that the American Society of Agricultural Engineers is justified in taking credit for another valuable contribution to the country's war effort. The Committee hopes its proposed plan was found worthy of consideration by those charged with responsibility for the federal program for rationing farm operating equipment. It is also hoped that when future historians report the present world conflict it may not be said of America's food production efforts, "Too little and too late", but rather *"Plenty and prompt"*.

FARM PRODUCTION RATING FORM

Recommended by the Committee on Wartime Allocation of Farm Machines of the American Society of Agricultural Engineers

SECTION I — *Production*

CROP PRODUCTION

Products	Acres	Yield per Acre	Units	Production in Units	Factor	Weighted Production Units Col. 5 x Col. 6
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corn (for all purposes)	163	62	100 bu	100	90	9,000
Wheat	27	39	100 bu	10.5	41	430
Oats	30	48	100 bu	14.4	27	390
Barley	.....	.....	100 bu	.....	30	.....
Rye	.....	.....	100 bu	.....	64	.....
Rice	.....	.....	100 bu	.....	43	.....
Mixed grains	.....	.....	100 bu	.....	30	.....
Peanuts	.....	.....	100 bu	.....	18	.....
Soybeans (harvested for beans)	60	31	100 bu	18.6	45	840
Cowpeas	.....	.....	Acre	.....	9	.....
Velvet beans or forage beans	.....	.....	Acre	.....	9	.....
Beans (edible)	.....	.....	100 bu	.....	70	.....
Hay (all including sorghum for forage)	9	1.75	Tons	15.6	5	78
Tobacco	.....	.....	100 lb	.....	15	.....
Cotton	.....	.....	Bale	.....	220	.....
Sugar cane	.....	.....	Acre	.....	75	.....
Sugar beets	.....	.....	Ton	.....	12	.....
Flax	.....	.....	100 bu	.....	60	.....
Potatoes (Irish)	.....	.....	100 bu	.....	64	.....
Potatoes (sweet)	.....	.....	100 bu	.....	94	.....
Vegetables (all)	.....	.....	Acres	.....	125	.....
					Total Crop Production Units	10,738

LIVESTOCK PRODUCTION

Products	Units	Total Production	Units	Production in Units	Factor	Weighted Production Units Col. 5 x Col.6
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Beef cattle including calves	10	13,400	100 lb	134	3	400
Milk cows (dry)	.....	.....	100 lb	.....	3	.....
Butterfat	.....	.....	100 lb	.....	120	.....
Milk	.....	.....	1000 lb	.....	33	.....
Hogs	70	12,500	100 lb	125	4.2	530
Sheep	.....	.....	100 lb	.....	4	.....
Chickens	40	.....	Each	40	2	80
Eggs	.....	282 doz	10 doz	28.2	2.5	72
Turkeys	.....	.....	Each	.....	8.0	.....
					Total Animal Production Units	1082
					Total Crop Production Units	10738
					Grand Total Production Units	11820

SECTION II — *Work Required*

TIME UNITS

	Months of Work	Factor	Time Units, Col. 1 x Col. 2
	(1)	(2)	(3)
Men—15 to 60 years old	36	1	36
Men—Over 60 years	.....	0.5	.....
Women—15 years and older	.....	0.5	.....
Children—14 years and younger	3	0.5	1.5
		Total Time Units	37.5

SECTION III — *Production Rating*

The production rating is determined by dividing the grand total of weighted production units from Section I above by the total time units from Section II.

Production Rating = 11820 ÷ 37.5 = 315

Alcoa departed from tradition when they first introduced Aluminum as a conductor material to the electrical industry. Imagineering at work, forty-odd years ago, visualized a new, high conductivity, lightweight, corrosion-resistant conductor material. Then they engineered it into reality; first all-Aluminum, then A. C. S. R.

A million miles of Aluminum Cable Steel Reinforced, in service on hi-lines and rural lines all over America, long ago proved the sound thinking of those early Imagineers. Aluminum bus conductors, in the form of flat bars, tubing and channels, have also proved their worth in central stations, substations and industrial plant distribution systems.

Today, new concepts of Aluminum arise from the swift technological advances resulting from the war effort and the greatly increased Aluminum production. New joining methods, new fabricating procedures, new alloys, new commercial forms, all combine to provide new economies and to broaden post-war applications of Aluminum.

Many of these new applications will be electrical. Versatile Aluminum will become an even more important tool in the hands of the electrical engineer. We'll gladly discuss the economic aspects of Aluminum with you as they apply to your design problems. ALUMINUM COMPANY OF AMERICA, 1976 Gulf Building, Pittsburgh, Pennsylvania.

An Appreciation of Dr. E. A. White

By Walter B. Jones

A PIONEER figure in the profession of agricultural engineering and a great friend to many of its members was lost in the passing of Earl A. White on December 6, 1942, at his home in Evanston, Illinois. It was the time of the Fall Meeting of the American Society of Agricultural Engineers in Chicago, and Doctor White's absence from his accustomed participation caused much comment and some concern, though even his close friends were not prepared for any such news as came to cast its shadow over the meeting.

Yet in the timing of his untimely loss there was something symbolic of fulfillment. Doctor White had been present at the birth of the Society. Though yet an undergraduate, he came as representative of the University of Illinois to the historic organization meeting of the A.S.A.E. in the Agricultural Engineering Building on the campus of the University of Wisconsin at Madison, Wisconsin, in December 1907, and thereby became one of the dozen-odd charter members of the American Society of Agricultural Engineers. And then, after thirty-five years of devotion to the Society and distinction in the profession, he came to the end of his career as his colleagues gathered nearby to carry forward the work which he laid down.

EARL A. WHITE
1883-1942

Earl A. White was born December 17, 1883, on a farm near Antioch, Lake County, Illinois. In his boyhood began the association with farm machinery which was to lead to an engineering lifework, since both his father and an uncle were threshing machinery operators, the most exacting application of mechanics in farming at that time. Aside from that, the record affords but little light on his early life and education until he appeared at the University of Illinois, whence he was graduated with the bachelor of science degree in 1908.

There he became something of a legendary figure, largely because of his prowess on the football field. One of the legends is that he came by the nickname "Prep" because of his athletic achievement while still a preparatory student. For at least a decade, three generations in college life, and despite the disillusionment of his presence as a professor, Prep's pigskin achievements persisted as a campus tradition. For more years than most men play collegiate football he was deemed the outstanding center of the Big Ten, and is given credit for leading the Illini to their first championship in many years.

In 1913 he won his master's degree in science from the University of Wisconsin, and in 1917 the Ph. D. degree from Cornell University, the first doctorate ever conferred for work in agricultural engineering. His work at Cornell culminated in the mathematical analysis of the moldboard plow as "an hyperboloid of the third order" and set a landmark between the ages of empiricism and the era of theoretical design in plowmaking.

According to his own grudging data for the Society's membership record, Doctor White was a "member of the faculty of the College of Agriculture, University of Illinois, intermittently from 1908 to 1918." His professional friends and students bear witness to his developing what was then called "farm mechanics," a poor relation in the department of agronomy, to a stature which shortly after his time earned transformation into the department of agricultural engineering.

Actually it was not until 1919 that he left the University and went to Peoria, Illinois, to carry on investigation and research for what is now the Caterpillar Tractor Company in the welding of Holt and Best lines into the unified Caterpillar family of track-laying tractors. In the spring of 1920 Doctor White became technical editor of "Farm Implement News," continuing with notable success in that capacity until he resigned in September of 1923 to become the active head, designated as Director, of the newly formed national Committee on the Relation of Electricity to Agriculture.

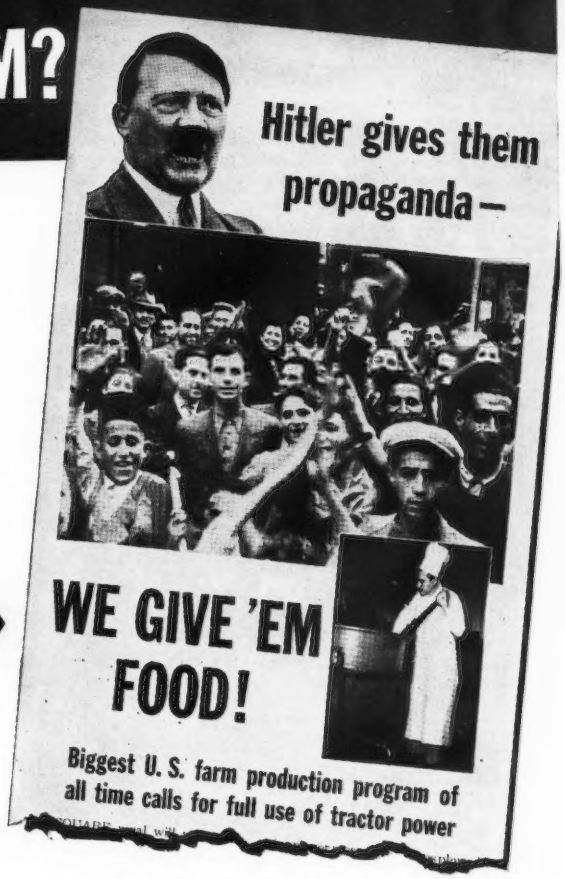
From that time forth, his genius and his energy were concentrated on the task of bringing the blessings of electric light, power, and other applications to agricultural operations and rural people. It is hard to evaluate, or even to say, just what he did, other than the routine of administering the office, conducting the business and compiling the reports of the CREA. Always reticent almost to the point of shyness, he seemed to shun personal prominence in the affairs of the Committee. It might be said that he attained obscurity.

Yet from his counsel, inspiration, and drive came the emergence of farm electricity from economic impossibility to a servant that nearly every farmer now holds it his right to have. Research in application, linebuilding, rate structures, all gained by his guidance. Distribution lines advanced into new territory as never before, even as had the line of scrimmage advanced when Prep White played center.

Eventually, hastened by the depression but due mainly to its having done well its part in the changing pattern of rural electrification, the CREA concluded its organization and bequeathed its functions to other agencies. The major opus in Doctor White's professional life was finished. Something of its significance was put into words by Geo. W. Kable, requested by the Rural Electric Division of the A.S.A.E., then in session, to express sympathy to Mrs. White and her two daughters. In closing his message he said: "There are few of us in the rural electrification field whose lives have not been directly influenced by Doctor White. We have always looked upon him as the leader of the rural electrification movement, and it is because of the pioneering work he did that we are now in that field. We have kindly and appreciative memories of him."

Besides being a charter member of A.S.A.E., Doctor White was president of the Society for the 1921 term. During the 1927-28 Society year he was chairman of the Rural Electric Division. In 35 years of faithful attendance and activity, his committee ap- *(Continued on page 30)*

WHAT'S YOUR PART IN PRODUCING FOOD FOR FREEDOM?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Every farm in America, large or small, must produce all it can. Farmers need help to do it. The Department of Agriculture is helping. The War Manpower Commission is helping. The Office of the Petroleum Administrator for War is helping. And so can you—by urging farmers to keep their equipment in first-class condition and by telling them how to get more power out of their tractors.

This advertisement is being published by the Ethyl Corporation to tell farmers why they should have you convert their tractors to high compression.

You can help farmers get more power by converting their tractors to high compression

One big source of extra farm power is gasoline. But thousands of farmers who have switched to gasoline are not getting full benefit from its many advantages. *Here's where you can help!*

1. Point out to every farmer who brings a tractor in for an overhaul that by changing over to high altitude pistons, making other necessary adjustments, and burning gasoline he can increase power up to 30 per cent.

2. Tell farmers whose tractors are not yet ready for an overhaul that by installing cold type spark plugs, adjusting the carburetor, setting the manifold to cold position and switching from kerosene or distillate to gasoline they can increase power as much as 12 per cent.

3. Assure your customers that there is no shortage of gasoline for use in tractors. The real reason for gasoline rationing is conservation of *rubber*. Actually, gasoline for tractors is in far greater supply than kerosene or distillate in nearly every section of the country.

The Ethyl Corporation has published an interesting book entitled, "High Compression Overhaul and Service." If you have not already received a copy, write to Agricultural Division, Ethyl Corporation, Chrysler Bldg., New York, N.Y.—manufacturer of antiknock fluid used by oil companies to improve gasoline.

FARM POWER IS FIGHTING POWER

MAKE EVERY OVERHAUL A HIGH COMPRESSION OVERHAUL

NEWS

Nominations for 1943-44 A.S.A.E. Officers

THE Nominating Committee of the American Society of Agricultural Engineers, consisting of Deane G. Carter (chairman), A. P. Yerkes, and E. D. Anderson, have placed in nomination the following members of the Society for the various offices to be filled at the next annual election of officers:

For President

ARTHUR W. TURNER, educational advisor, International Harvester Company

For Councilor

W. D. ELLISON, project supervisor, watershed and hydraulic studies, Soil Conservation Service, USDA

HOWARD MATSON, chief, engineering division (Region 4), Soil Conservation Service, USDA

For Councilor

H. J. BARRE, agent, Bureau of Agricultural Chemistry and Engineering, USDA, and research assistant professor of agricultural engineering, Iowa State College

F. C. FENTON, head, agricultural engineering department, Kansas State College

Nominating Committee

A. W. CLYDE, Pennsylvania State College
W. N. DANNER, JR., University of Georgia
E. L. HANSEN, Portland Cement Association
F. P. HANSON, Caterpillar Tractor Company
J. D. LONG, Douglas Fir Plywood Association
S. P. LYLE, U. S. Department of Agriculture

The By-Laws of the Society provide that by March 1st of each year the Secretary of the Society shall mail each member entitled to vote a ballot stating the names of the candidates for elective offices to be filled at the next election.

A.S.A.E. Pacific Coast Section To Hold Wartime Meeting

THE Pacific Coast Section of the American Society of Agricultural Engineers will hold its annual meeting February 5 and 6 on the campus of Utah State Agricultural College at Logan.

The program of the meeting as announced by Dr. O. W. Israelsen, chairman of the Section, opens on February 5 with an address of welcome by Dr. E. G. Peterson, president of the U.S.A.C. This will be followed by a talk on the wartime work of the U.S.A.C. school of engineering by Dean George D. Clyde, and another talk on some of the wartime tasks of the extension agricultural engineer by A. C. Jacquot, head of the agricultural engineering department of U.S.A.C. The president of the American Society of Agricultural Engineers, H. B. Walker, head of the agricultural engineering division, University of California, will address the session on the wartime problems and services of agricultural engineers. Director William Peterson of the Utah Agricultural Extension Service will talk on state reclamation problems, and Joseph Coulam, assistant professor of woodworking and building construction, U.S.A.C., will present a paper on farm building improvements to meet war needs.

The afternoon session of February 5, it is expected, will be favored by a talk on the guayule emergency rubber project sponsored by the USDA by Henry F. Blaney, agricultural engineer, irrigation division, Soil Conservation Service, and also a talk by J. E. Christiansen of the USDA Regional Salinity Laboratory on agricultural engineering phases of the alkali problem in wartime food production. T. H. Humphreys of the National Resources Planning Board has been engaged to discuss agricultural improvement projects after the war. The session will close with a paper by J. H. Maughan, water utilization technician of the USDA Bureau of Agricultural Economics on emergency activities of the water facilities program.

At the first session of the second day of the meeting, A. H. Powell, engineer of the Morning Milk Company of Salt Lake City, will talk on wartime engineering problems in processing dairy products. At this session it is hoped to have Clyde L. Anderson, assistant agricultural engineer of the U. S. Soil Conservation Service, talk on water and soil conservation activities in Utah. V. C. Stanbery, regional counselor of the National Resources Planning Board, has been engaged to talk on emergency planning by the Board for the western states. The state engineer of Utah, Ed. H. Watson of Salt Lake City, will discuss some of the contributions of western states engineers toward solving irrigation and drainage problems. W. W. McLaughlin, chief of the irrigation division of the S.C.S., will talk on the emergency phases of the work his division is doing in wartime. The technical part of the program will be brought to a close by a paper by Chairman O. W. Israelsen, who is research professor of irrigation and drainage at Utah Agricultural Experiment Station, on canal lining research in relation to wartime food production.

The technical program will be followed by a short business session of the Section, including the election of officers.

The officers of the Section extend cordial invitation to attend its meeting, to all members of the Society and any others who may be interested.

A.S.A.E. Meetings Calendar

Feb. 5 and 6—Pacific Coast Section Meeting, Logan, Utah.

June 21 to 23—Annual Meeting, Purdue University, Lafayette, Ind.

Dr. Skinner Head B.A.C.E.

AGRICULTURAL engineers will be interested in the announcement of the Secretary of Agriculture recently that Dr. William W. Skinner had been appointed chief of the Bureau of Agricultural Chemistry and Engineering of the Department of Agriculture to fill the vacancy caused by the passing of Dr. Henry G. Knight some months ago. Dr. Skinner has served as associate chief of the Bureau since it was created a few years ago by the consolidation of the Bureau of Chemistry and the Bureau of Agricultural Engineering.

Southeast Meeting Postponed

IT WAS stated in AGRICULTURAL ENGINEERING for December that a meeting of the Southeast Section of A.S.A.E. was possible for the first week in February. However, it has since been decided by the officers of the Section not to hold the meeting. Because members of the Section pretty generally have exceedingly full schedules of work, and also because federal agencies have discontinued authorizing travel to professional conferences, it was decided to postpone the Southeast Section meeting until 1944. Another reason for not holding the meeting is because recent conferences on farm machinery and dehydration problems have met the needs of agricultural engineers in the area to a large extent.

In this connection it has recently been announced by the secretary of the Association of Southern Agricultural Workers that plans are being made to hold the convention was cancelled for this year, in New Orleans in February 1944. In that event, the A.S.A.E. Southeast Section will plan to follow its practice of recent years and hold its meeting in conjunction with the ASAW convention.

Personals of A.S.A.E. Members

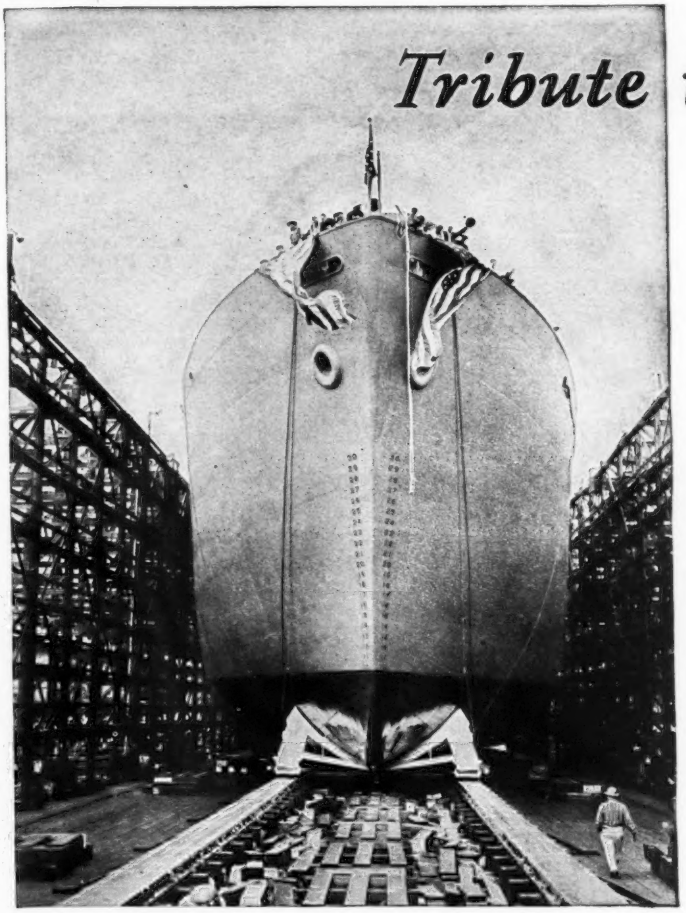
Frank J. G. Duck is now public relations representative of the New York office of N. W. Ayer & Son. He was previously secretary of the Farm Electrification Bureau of the National Electrical Manufacturers Association.

Leonard J. Fletcher, director of training and agricultural engineer, Caterpillar Tractor Co., was recently elected as a member of the council of the Society for the Promotion of Engineering Education (SPEE), for a three-year term.

Edwin L. Hansen, agricultural engineer, Portland Cement Association, is author of Bulletin Series No. 333, entitled "The Suitability of Stabilized Soil for Building Construction," issued in December 1941 by the engineering experiment station of the Uni-

(Continued on page 30)

Tribute to a Pioneer



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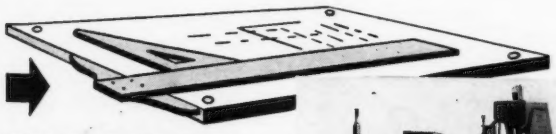

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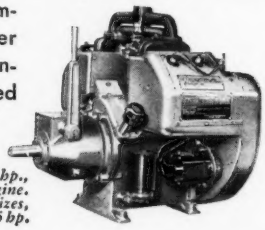

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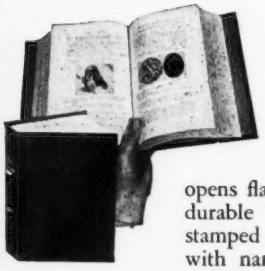

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Personals of A.S.A.E. Members

(Continued from page 28)

versity of Illinois. The work on which this bulletin is based was done by Mr. Hansen when he was a member of the agricultural engineering staff of the University and doing graduate work in civil engineering.

George Krieger, chief engineer, agricultural and industrial power equipment division, Ethyl Corporation, was recently appointed deputy director of the Farm Machinery and Equipment Division of the War Production Board.

Arnold Nicholson formerly an associate editor of "The Country Gentleman," is now managing editor of that publication.

R. O. Pierce is now district irrigation engineer, USDA emergency guayule rubber project at Salinas, California, and is in charge of irrigation practices in the Salinas district for the irrigation of the guayule shrub. Previously he was associate civil engineer in the Farm Security Administration.

F. L. Skelton is now chief engineer, Belle City Mfg. Co., Racine, Wis. He was formerly superintendent of a CCC project of the U. S. Soil Conservation Service in Illinois.

E. B. Wahlgren has been advanced from the rank of instructor to assistant professor agricultural engineering at Utah State Agricultural College.

J. C. Wooley and *R. L. Ricketts,* agricultural engineers, University of Missouri, are joint authors of "Catalog of Missouri Building and Equipment Plans," covering dairy buildings; hog houses and equipment; buildings and equipment for beef cattle, sheep and work stock; poultry houses; storage buildings, and farm houses, has recently been published by the Missouri Agricultural Extension Service.

Applicants for Membership

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Joseph Coulam, assistant professor of woodwork and building construction, Utah State Agricultural College, Logan, Utah. (Mail) 566 E. 6th North St.

Russell S. Dania, aviation mechanic, Army Air Force, USA. (Mail) 577 N. E. 62nd St., Miami, Fla.

Paul O. Esmay, engineer, Sears Roebuck & Co., Chicago, Ill.

Thomas F. Hintze, chief chemical engineer, War Production Board. (Mail) 191 Poplar Circle, N. E., Atlanta, Ga.

Richard I. Raycroft, manager of manufacturer's sales, Firestone Tire & Rubber Co. of Canada, Ltd. (Mail) 63 Haddon Crescent, Hamilton, Ont., Canada.

Henry J. Schweim, secretary and general manager, Gypsum Association, 211 W. Wacker Drive, Chicago, Ill.

An Appreciation of Dr. E. A. White

(Continued from page 26)

pointments and other, less formal duties done are too many for mention. And yet the Doctor White that we shall treasure in memory is the unmistakable figure of the athlete, settled almost out of sight in a big deep chair, talking little but saying much in huddle after huddle with colleague and crony beside the meeting-room door.

Probably not generally known to most of the Society members is the firm guidance which Doctor White gave to AGRICULTURAL ENGINEERING at a crucial point in its life. Some four months old when he became the president at the beginning of 1921, the Journal faced the difficulties of the agricultural depression which had settled suddenly on America. Through his understanding of publishing problems and his powers of persuasion, arrangements were made to handle printing, mailing, and some aspects of advertising in the plant of the Power Farming Press at St. Joseph, Michigan. From that period of foster parentage, long since outgrown, comes in part the present location of the Society headquarters. Thus this publication lived, and lives on, in some measure as a monument to the wisdom of Earl A. White.